STATE OF VERMONT
AGENCY OF TRANSPORTATION
133 State Street, Administration Building
Montpelier, Vermont 05602

October 19, 1989

Ms. Diane Conrad
Hazardous Sites Section Chief
Agency of Natural Resources
103 South Main Street
Waterbury, Vermont 05676

Dear Diane:

Please find enclosed the site assessment and hydrogeological investigation performed by Wehran Engineering for our Mendon Maintenance garage.

Feel free to contact us if you have any questions.

Sincerely,

Frank E. Aldrich

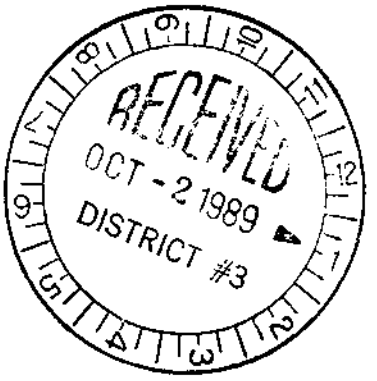
Frank E. Aldrich
Director of Maintenance

FEA:gs
Enclosure

WehranEnviroTech

Wehran Engineering Corporation
100 Milk Street
Methuen, Massachusetts 01844
Tel: 508-682-1980
Fax: 508-682-1980 Ext. 2006

September 29, 1989



Mr. Wayne A. Jarvis
District Transportation Administrator
R.R.1 Box 4469
Rutland, VT 05701-9725

RE: Environmental Assessment Report
Wehran Project No. 09424.HF

Dear Mr. Jarvis:

Per our conversation, attached are two (2) copies of the Environmental Assessment Report, recently completed for the Mendon facility.

If you have any questions, feel free to contact myself or Chuck Race.

Sincerely,

WEHRAN ENGINEERING CORPORATION

Gary Kjelleran

Gary Kjelleran
Senior Hydrogeologist

Enclosure

GK/CDR/mje/007

cc: C. Race

ENVIRONMENTAL SITE ASSESSMENT

OF THE AGENCY OF TRANSPORTATION MAINTENANCE AREA

Prepared For

STATE OF VERMONT

AGENCY OF TRANSPORTATION

RUTLAND, VERMONT

Prepared By

Wehran Engineering Corporation

Chace Mill 3-20, One Mill Street

Burlington, Vermont 05401

WE Project No. 09424.HF

September, 1989

VERMONT AGENCY OF TRANSPORTATION

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VERMONT AGENCY OF TRANSPORTATION

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EXECUTIVE SUMMARY

Wehran Engineering conducted an environmental assessment of the Agency of Transportation (AOT) maintenance area located along Route 4 in Mendon, Vermont. The purpose of the assessment is to determine if there are regulatory impacts to groundwater and surface water as a result of alleged pesticide dumping and waste disposal, and the on-site roadside-trash landfill.

The site investigation included development of a site plan, a surface geophysics survey, supervision of eight monitoring well installations, permeability testing and an assessment of water quality in groundwater and in surface water from Mendon Brook.

The terrain conductance investigation indicated that metal is buried in an open area encompassing the alleged 2,4-D disposal location. Analysis of groundwater for 2,4-D and 2,4,5-TP indicated that both compounds were below State of Vermont Preventative Action limits.

At the roadside-trash landfill, elevated terrain conductance in the vicinity could be the result of elevated concentrations of chloride in shallow groundwater, dispersed metal, or other conductive waste.

Groundwater collected from monitoring well (MW-7) located downgradient from the roadside-trash landfill, exceeded State of Vermont Preventative Action Limits for chloride and manganese. Specific conductance and total organic carbon are also elevated downgradient from the landfill indicating that other unidentified dissolved inorganic and organic compounds may have impacted groundwater at the site. Parameters analyzed that are not adversely impacting groundwater are chromium, iron, lead and volatile organic compounds.

Locally, groundwater flows from the AOT maintenance site toward Mendon Brook. Mendon Brook is not impacted by chloride, chromium, iron, lead, manganese, pH, specific conductance, total organic carbon or volatile organic compounds.

In conclusion, based on a summary of the results of the environmental assessment, there appears to be no significant impacts, at this time, to groundwater or surface water, resulting from disposal of 2,4-D from the

alleged area. Although past disposal practices at the AOT Mendon facility may have caused elevated chloride and manganese concentrations, this occurs at only one groundwater monitoring location and does not effect Mendon Brook. The shallow groundwater at the site is not considered as a water supply, therefore the elevated levels of chloride do not pose a health risk. Elevated concentrations of chloride are objectionable only from the characteristic of taste. Dissolved manganese is generally below detection limits, and the fact that it exceeds preventative action limits at one groundwater monitoring location is considered to be not significant at this time. Manganese is a naturally occurring element and is present in Mendon Brook upstream from the facility. Observed elevated TOC concentrations may result from natural organic matter dissolved in groundwater or elevated concentrations of synthetic organic compounds excluding volatile organics (EPA Methods 601 and 602), which were undetected in groundwater near the AOT landfill and surface water along Mendon Brook.

1.0 INTRODUCTION

Pursuant to a proposal dated March 29, 1989, Wehran Engineering Corporation (Wehran) has conducted an environmental assessment of the State of Vermont Agency of Transportation (AOT) maintenance area located along Route 4 in Mendon, Vermont (site) (Figure 1-1). AOT was concerned regarding potential impacts, resulting from past disposal practices at the site. A landfill located at the site was utilized for disposal of roadside trash. Other wastes, as yet to be identified, may have been disposed of at the landfill. In addition, there were allegations of pesticides dumping on the site which is located within the watershed of the City of Rutland water supply.

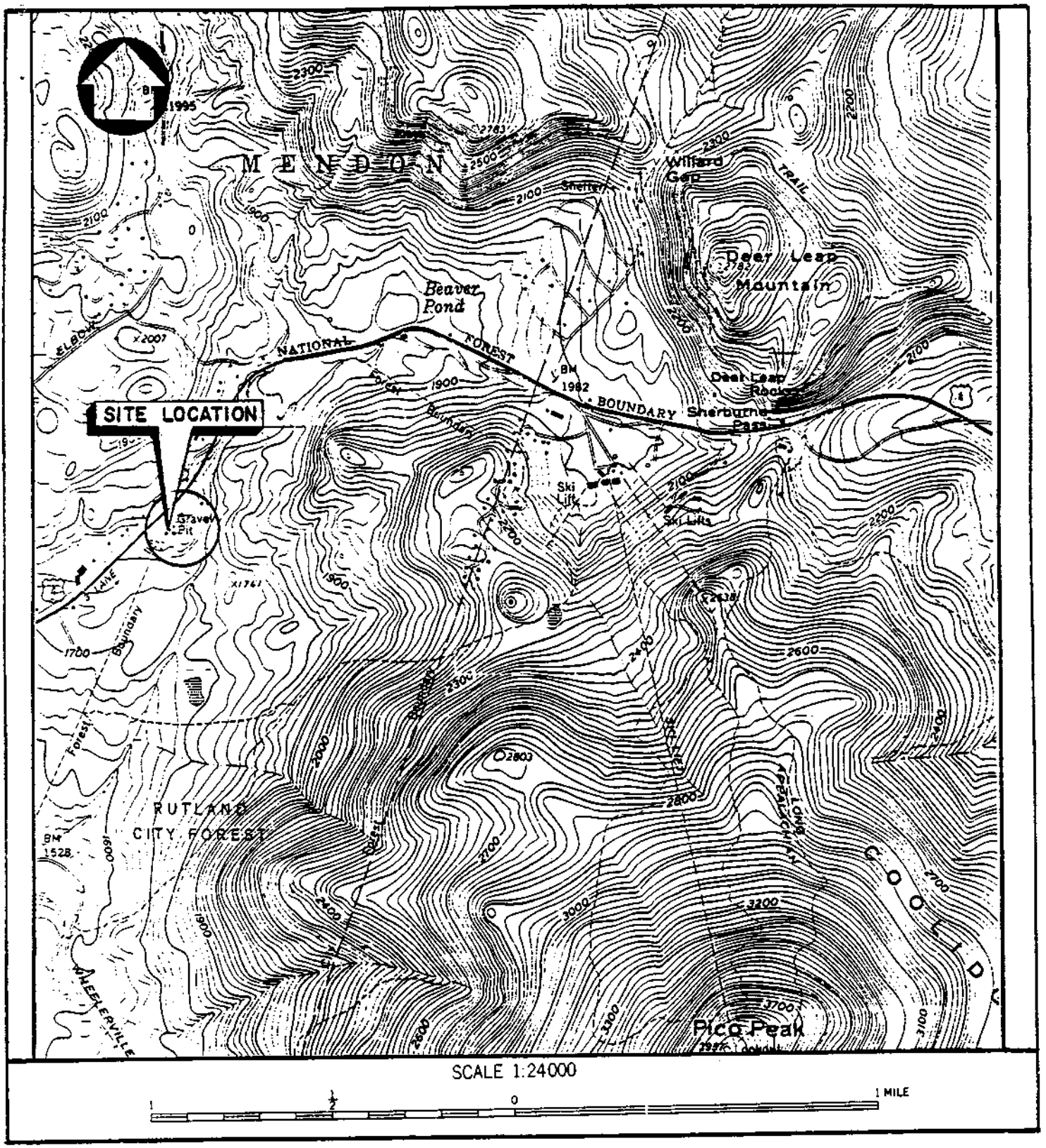
1.1 SITE HISTORY

The site is a former gravel pit purchased by the State of Vermont for use as a vehicle maintenance and storage facility. During the 1960's and 1970's, the central portion of the site (indicated as AOT landfill on Figure 1-2) was used for disposal of roadside trash and other wastes.

Based on conversations with AOT, the landfill was a disposal site for roadside trash and litter. AOT also disposed of triple rinsed 2,4-dichlorophenoxyacetic acid (2,4-D) containers at the landfill. No hazardous wastes are known to be disposed at the landfill based on conversations with AOT.

A second concern is the alleged dumping of the herbicide 2,4-D at the northeast corner of the site (shown on Figure 1-2). The allegation stated that a number of five gallon containers and one, 55-gallon drum were disposed of by burial. The five gallon containers were alleged to be partially full and the drum reportedly contained a mixture of diesel fuel and 2,4-D. The specific burial location is unknown and the person making the allegation is unavailable for clarification.

The site is no longer utilized for waste disposal. Current use includes vehicle maintenance, salt and sand storage, and equipment storage. Pure salt is fully enclosed in a storage building on site. Salt is mixed with sand west of the landfill.



SCALE: 1" = 2,083'
TOPOGRAPHY TAKEN FROM
PICO PEAK, VT - 1961
PHOTOREVISED 1980

U.S.G.S. QUADRANGLE
7.5 MINUTE SERIES

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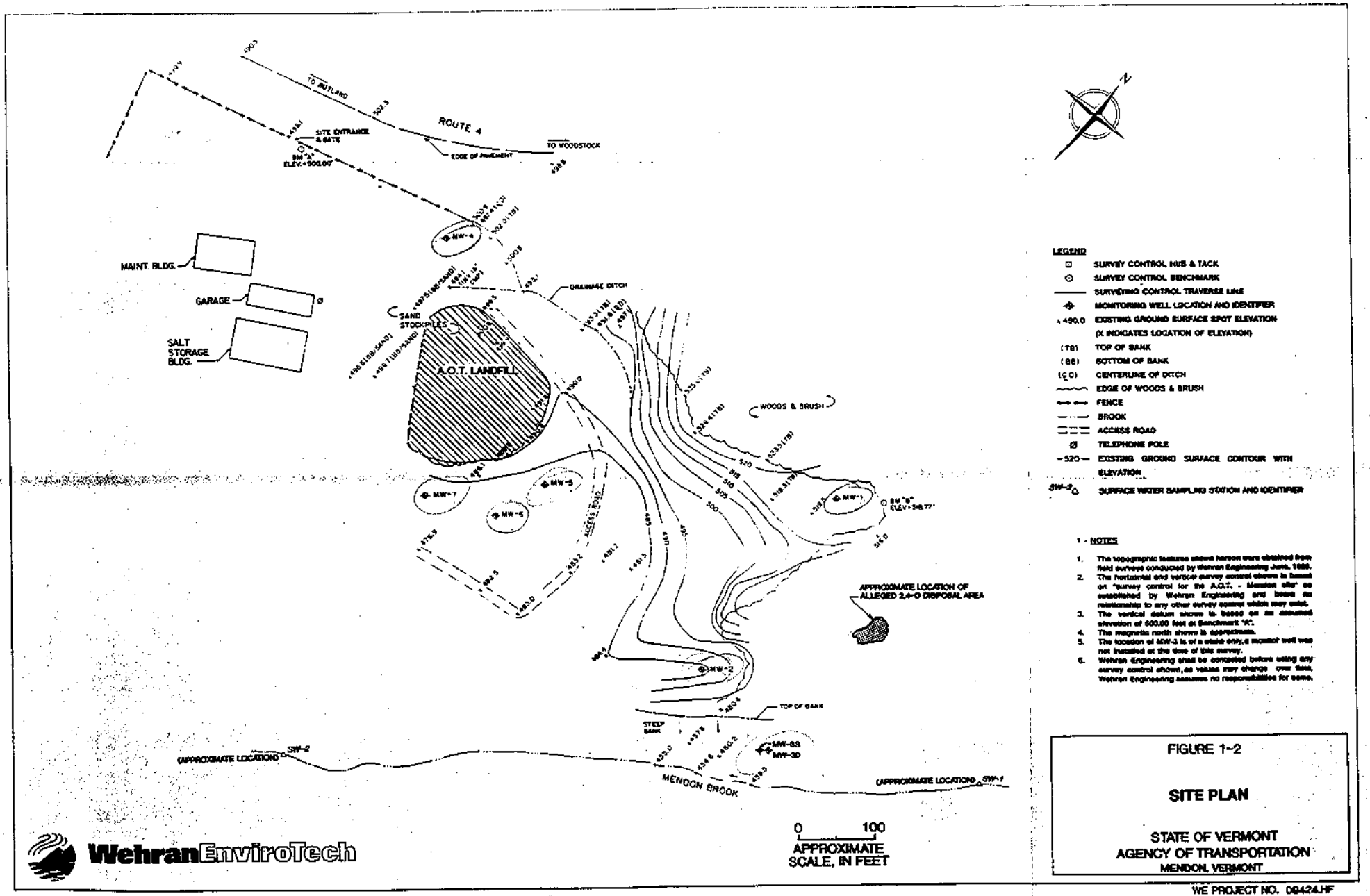
QUADRANGLE LOCATION

FIGURE 1-1

SITE LOCATION MAP

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MENDON, VERMONT

WE PROJECT NO. 09424.HF



LEGEND

- SURVEY CONTROL HUB & TACK
- SURVEY CONTROL BENCHMARK
- SURVEYING CONTROL TRAVERSE LINE
- MONITORING WELL LOCATION AND IDENTIFIER
- x 490.0 EXISTING GROUND SURFACE SPOT ELEVATION (X INDICATES LOCATION OF ELEVATION)
- (TB) TOP OF BANK
- (BB) BOTTOM OF BANK
- (CL) CENTERLINE OF DITCH
- EDGE OF WOODS & BRUSH
- FENCE
- BROOK
- ACCESS ROAD
- Ø TELEPHONE POLE
- –520– EXISTING GROUND SURFACE CONTOUR WITH ELEVATION
- SW-2 SURFACE WATER SAMPLING STATION AND IDENTIFIER

1 - NOTES

1. The topographic features shown hereon were obtained from field surveys conducted by Wehran Engineering June, 1988.
2. The horizontal and vertical survey control shown is based on "survey control for the A.O.T. - Mendon site" as established by Wehran Engineering and bears no relationship to any other survey control which may exist.
3. The vertical datum shown is based on an assumed elevation of 500.00 feet at Benchmark "A".
4. The magnetic north shown is approximate.
5. The location of MW-3 is of a stake only; a monitor well was not installed at the time of this survey.
6. Wehran Engineering shall be contacted before using any survey control shown, as values may change over time. Wehran Engineering assumes no responsibilities for same.

FIGURE 1-2

SITE PLAN

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MENDON, VERMONT

WE PROJECT NO. 09424.HF

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1.2 PURPOSE AND SCOPE

The purpose of this environmental investigation is to evaluate the impact of past land use practices and alleged 2,4-D disposal in the groundwater and surface water of the site.

Specific objectives of this investigation are to:

- Use surface geophysics (terrain conductance) to search for the presence of conductive material in the vicinity of the alleged 2,4-D disposal area, and delineate the boundaries of the AOT landfill.
- Evaluate hydrogeologic conditions at the site, including depth to glacial till, hydraulic conductivity and groundwater flow direction.
- Determine if there are any significant impacts to groundwater and surface water quality.
- Recommend further actions, if necessary.
- Develop, if necessary, a detailed remedial assessment plan.

The scope of work performed at the site included development of a site plan, a terrain conductance survey of the alleged 2,4-D disposal area and AOT landfill, installation, development, and survey of eight monitoring wells, hydraulic conductivity testing, groundwater sampling and analysis, and preparation of a report.

This report presents the results of this initial environmental assessment, followed by an assessment of environmental impacts, summary and conclusions and recommendations for additional work.

2.0 SITE INVESTIGATION AND ASSESSMENT

The site investigation includes development of a site plan, a terrain conductance survey, regional and site geology, descriptions of aquifer characteristics and an assessment of groundwater and surface water analytical results.

2.1 SITE PLAN DEVELOPMENT

A site plan (Figure 1-2) showing prominent features at the site was developed by Wehran. The site plan shows the approximate extent of the alleged 2,4-D area, the AOT landfill, monitoring well locations and topographic features present when the survey was done in June, 1989. At the time of the survey, all monitoring wells were installed except MW-3S and MW-3D. The location and elevation of MW-3S and MW-3D were adjusted for well stickup. The vertical datum is a benchmark labeled "BM-A", assigned an arbitrary elevation of 500 feet.

2.2 SURFACE GEOPHYSICS

Terrain conductance was selected as a means of locating buried metallic materials that might be associated with the disposal of 2,4-D on-site and to delineate the approximate extent of the AOT landfill.

2.2.1 Methodology

The terrain conductance method measures the ability of the soil mass to transmit an electrical signal. The magnitude of the electrical response is directly proportional to the conductance of the subsurface materials. Metallic drums and other metal waste are highly conductive and are therefore easily detectable.

The terrain conductance instrument used at the site was a Geonics EM-31. This instrument has sufficient penetration to evaluate the upper several meters of the soil, which is sufficient to meet the objectives of this study.

The survey of the alleged 2,4-D area and AOT landfill entailed construction of a grid of traverse lines and then measurement of the terrain conductance at each of the grid nodes. The survey was designed to cover a

area larger than the alleged disposal area in order to provide assurance that drums or containers would be detected. More specific information regarding the theory and operation of the Geonics EM-31 is provided in Wehran's proposal. Terrain conductance survey data are provided in Appendix A.

2.2.2 Results Alleged 2,4-D

The terrain conductance survey indicated that there is a sizable quantity of metallic wastes buried in the general vicinity of the alleged 2,4-D site. In some cases this waste is exposed. It consisted primarily of food cans, some empty five gallon paint cans and an occasional 55-gallon drum. All cans and drums were rusted and in some cases would fall apart when disturbed. The waste appeared to be mostly domestic in origin with some obvious old AOT waste. This type of material is highly conductive and was easy to map. Traverses are oriented so that the waste limits were defined, and these limits are plotted on Figure 2-1. The allegation of 2,4-D disposal indicated that the herbicide was disposed of in five-gallon containers and a 55-gallon drum. If this was the case, it would be impossible to differentiate this waste from the other metallic waste identified.

2.2.3 Results AOT Landfill

The objective of the terrain conductance survey at the AOT landfill was to delineate the extent of the landfill. The landfill appears as a mound at the site as shown on Figure 2-1. The results of the EM-31 survey indicated anomalous readings on top of the landfill. Anomalous conductivity readings associated suggest the presence of buried metal. Beyond the landfill, elevated conductivity readings may indicate the presence of dispersed metal, buried waste, salts in shallow soils and/or elevated chloride dissolved in soil moisture and shallow groundwater. Groundwater, which occurs at 5 to 10 feet below land surface in monitoring wells MW-5, MW-6, and MW-7 near the landfill showed elevated chloride and conductivity (specific conductance). Salts were also observed in the floor of the pit and in a gully north of the landfill.

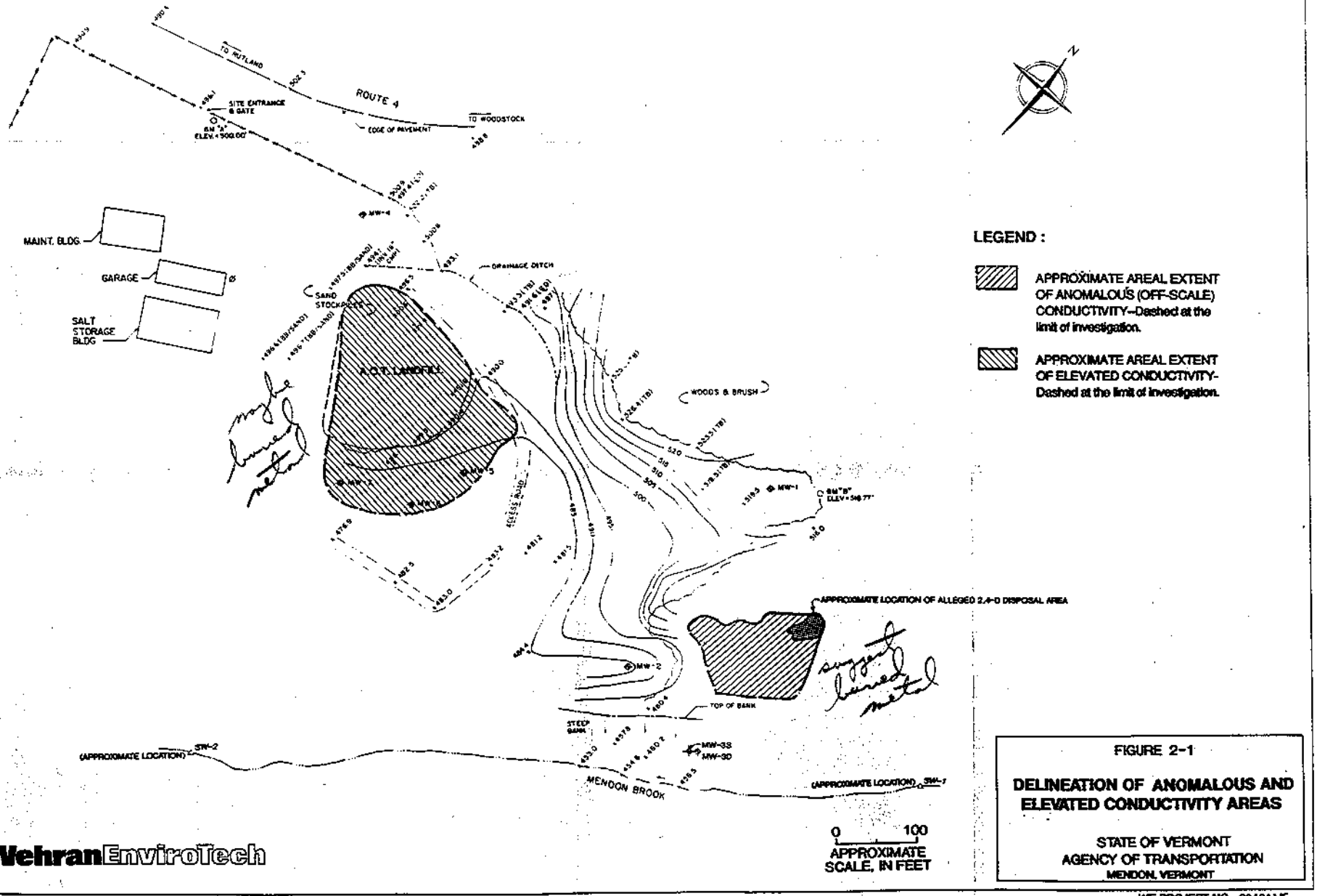

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FIGURE 2-1

DELINEATION OF ANOMALOUS AND ELEVATED CONDUCTIVITY AREAS

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MENDON, VERMONT

WE PROJECT NO. 09424-HF

2.3 GEOLOGY

Available geologic and water resources maps (Doll and Others, 1961; VTDWR, 1967; Stewart, 1972; USGS, 1983) were reviewed to develop an understanding of the geology and groundwater conditions occurrence in the vicinity of the site. No previous site specific hydrogeological investigations have been conducted at the AOT Mendon maintenance area. The following sections describe regional geology, drilling methods and subsurface materials encountered during drilling.

2.3.1 Regional Geology

In the region, sands and gravels are underlain by glacial till which is, in turn, underlain by bedrock. Thickness of unconsolidated deposits ranges from 30 to 100 feet, increasing from Route 4 toward Mendon Brook (USGS, 1983).

Surficial materials consists of stratified sands and gravels associated with kame terrace deposits (Stewart, 1972). These materials are generally well drained above the water table. Groundwater potential from the stratified sands and gravels is variable ranging from low to high (VTDWR, 1967; USGS, 1983). Saturated thickness of these stratified deposits generally exceed 20 feet (USGS, 1983).

The underlying glacial till is generally more compact than the overlying sand and gravel and contains a matrix of finer particles. Local groundwater flow directions in the surficial sands and gravels are expected to be influenced by the configuration of the upper surface of the glacial till.

Locally, bedrock consists of schists and gneisses of the Mount Holly Complex (USGS, 1983). Depth to bedrock ranges from 65 feet near the AOT garage to 96 feet north of Route 4 (USGS, 1983). A survey of bedrock wells in 1948 indicated bedrock yield ranging from 0.5 gallons per minute (gpm) to 40 gpm, with a median yield of 5 gpm (USGS, 1983).

2.3.2 Drilling Methodology

On May 31 through June 15, 1989, a total of eight borings were drilled by AOT personnel under supervision of a Wehran geologist. Hollow stem auger and drive and wash drilling techniques were utilized. The borings were

drilled to determine completion depths for monitoring well installation and for characterization for subsurface materials. Subsurface material classifications are presented along with well construction diagrams in Appendix B.

Soil samples were collected using a 2-inch outside diameter (OD), 24-inch long split spoon samples in accordance with ASTM-D-1586-84 methodology. The number of blows required to drive the sampler, using a 140-pound weight falling freely from 30 inches was recorded is a measure of material density. Geologic descriptions of the samples were classified at the site following the Modified Burmister System onto a detailed geologic log by the supervising geologist.

2.3.3 Subsurface Materials

During on-site activities, surficial sands and gravels were found to overlie glacial till. The surficial deposits are tan to brown, loose to moderately compact, medium to coarse sand and gravel with a trace of silt. These sands and gravels are stratified and interfinger with loose to moderately compact sands and silts.

In contrast, the underlying glacial till is brown to gray, very dense, moderately to highly compact, contained a higher content of finer sand and silt. Glacial till is identified at depths ranging from 10 feet below land surface (bls) (MW-3D) to 28 feet bls (MW-2). The till surface dips toward Mendon Brook based on a comparison of till elevations at MW-5 (456.1 feet) and MW-3D (446.4 feet).

Because of numerous cobbles and boulders encountered during drilling of MW-1, which prevented sufficient sampling recovery to identify glacial till, a structure contour map representing the configuration of the top of the till could not be constructed.

2.4 AQUIFER CONDITIONS

Characterization of the conditions in the perched sand and gravel aquifer is based on the construction of eight monitoring wells including groundwater level data, hydraulic conductivity testing, interpretation of groundwater flow directions and calculation of groundwater flow rates.

2.4.1 Monitoring Well Installation

Eight monitoring wells were installed in separate borings by AOT staff drillers under the supervision of a Wehran geologist. Placement of upgradient and downgradient monitoring wells, each monitoring well was constructed of Schedule 40 PVC flush threaded riser pipe and 10 slot (0.010 inch) screen with a base cap. Silica sand pack was placed around and at least two feet above the top of screen. Bentonite pellets were placed above the top of the sand pack to form a seal. A portland cement and bentonite grout was placed to ground surface (except at MW-2 where 10 feet of native material was allowed to collapse above a five foot seal). A locking steel protective casing was constructed at each of the monitoring wells. All monitoring wells were locked after the installation and development.

Each monitoring well was developed by pumping and surging water opposite the well screen until visual clarity was attained. Municipal supply water was utilized in developing the monitoring wells.

In the vicinity of the alleged 2,4-D disposal area, four monitoring wells were installed. Three monitoring wells were planned for completion directly above the till surface for monitoring potential migration of 2,4-D. (This compound is denser than water and could sink to the top of the till and potentially migrate along its surface.) During drilling at monitoring well locations MW-1, insufficient sample recovery, resulting from the presence of numerous cobbles and boulders, prevented the identification of glacial till. Because most of the monitoring wells were water table installations, MW-1 was also completed at the water table with approval by Agency of Natural Resources to provide a better definition of the water table configuration.

At the AOT landfill, one well (MW-4) was installed upgradient and three wells installed downgradient (MW-5, MW-6 and MW-7). All four monitoring wells, near the AOT landfill were completed at the perched water table, for monitoring potential impacts to groundwater. As-built monitoring well construction diagrams are provided with the geologic logs in Appendix B.

2.4.2 Groundwater Occurrence and Flow

Based on water levels measured on June 21, 1989, (Table 2-1), groundwater occurs at depths ranging from 0.7 feet below land surface (BLS) (MW-3S) to 43.2 feet BLS (MW-1). Saturated thickness of the water table aquifer varies from 9.1 feet (MW-2) to 14.8 feet (MW-3D) at locations where till was identified. The configuration of the water table on June 21, 1989 is presented as Figure 2-3. The direction of groundwater flow appears to coincide with the dip of the surface of the till, toward Mendon Brook. Depth to groundwater, aquifer saturated thickness, and magnitude of hydraulic gradients are expected to fluctuate in response to seasonal changes in recharge and discharge.

2-2

2.4.3 Hydraulic Gradients

Horizontal hydraulic gradient calculated between MW-1 and MW-3S and MW-4 and MW-7 are approximately 0.045 ft/ft. Near Mendon Brook, the head in the deeper well (MW-3D) is 0.5 feet higher than the head in the adjacent shallow well, (MW-3S), and the magnitude of the vertical gradient is approximately 0.06 ft/ft. The elevation of Mendon Brook, approximately 50 feet to the south of MW-3S/3D is 465.5 feet. . Therefore, an upward hydraulic gradient exists indicating groundwater discharges to Mendon Brook from the site.

2.4.4 In Situ Hydraulic Conductivity

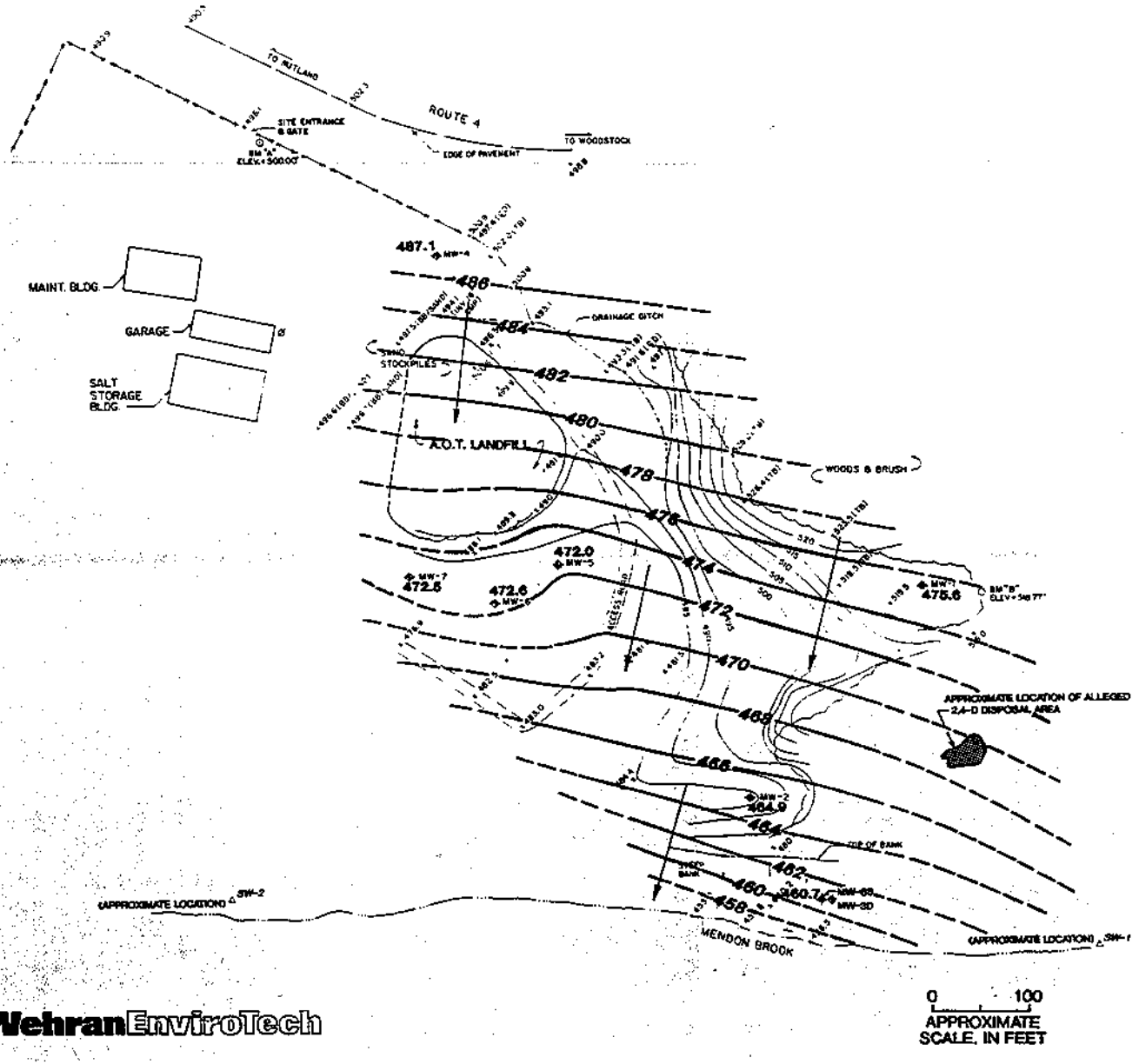
Hydraulic conductivity (permeability) is determined in seven monitoring wells using a slug test method. The method involves the removal of a known volume (or slug) from each well and water level recovery is measured using a sensitive pressure transducer connected to a data recorder. After the testing was completed, elapsed time and recovery data were downloaded to a personal computer. Hydraulic conductivity are calculated using a solution for unconfined aquifers (Bouwer and Rice, 1976; and Bouwer, 1989).

Horizontal hydraulic conductivity values ranges from 0.84 feet/day to 22.4 feet/day (Table 2-2). The values are representative of a small volume of aquifer immediately opposite the saturated sand pack interval in each well.

Table 2-1
VERMONT AGENCY OF TRANSPORTATION
GROUNDWATER ELEVATION SUMMARY

Monitoring Well Identification	Elevation Top of PVC Well (feet)	June 21, 1989 Depth to Groundwater Below Top of Well Casing (feet)	Groundwater Elevation (Feet)
MW-1	521.85	46.23	475.62
MW-2	486.38	21.50	464.88
MW-3S	464.30	3.60	460.70
MW-3D	464.50	3.25	461.20
MW-4	499.45	12.33	487.12
MW-5	483.79	11.75	472.04
MW-6	482.49	9.94	472.55
MW-7	482.56	10.06	472.50

NOTES:
- Groundwater surface elevation at adjacent stake corrected for length of monitoring well stickup.
- Measuring point at the lowest point along the top of PVC well casing.



LEGEND :

- MW-1 — MONITORING WELL AND IDENTIFIER
- 486 — WATER TABLE CONTOUR – Shows altitude of water table, June 21,1989. Dashed where approximately located. Contour interval= 2.0 feet. Datum is benchmark labeled BM "A" assigned an arbitrary elevation of 500 feet. Arrows show generalized direction of groundwater flow.
- 487.1 — WATER TABLE ALTITUDE— June 21, 1989

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FIGURE 2-2

APPROXIMATE CONFIGURATION OF WATER TABLE

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MENDON, VERMONT

WE PROJECT NO. 09424.HF

VERMONT A.O.T. MENDON

KEY TO WELL CONSTRUCTION AS - BUILTS

1) 2" ID Sch. 40 Flush Joint Pvc Screen 0.010' Slot

2) 2" ID Sch. 40 Flush Joint PVC Riser Pipe

3) Sand Pack

4) Bentonite Seal

5) Cement / Bentonite Grout

6) 3" ID Steel Protective Casing with Locking Cap

7) Natural Fill

Table 2-2
VERMONT AGENCY OF TRANSPORTATION
IN SITU CONDUCTIVITY OF SATURATED MATERIALS

Monitoring Well Identification	Horizontal Hydraulic Conductivity (feet/day)	Saturated Materials Tested
MW-2	4.5	Very dense coarse sand, with some gravel and silt
MW-3S	3.1	Boring not sampled
MW-3D	0.84	Very dense fine sand and silt with gravel
MW-4	7.1	Loose fine sand and silt
MW-5	5.4	Loose fine to medium sand, little silt and coarse sand
MW-6	9.6	Loose medium to coarse sand, trace silt
MW-7	22.4	Medium dense to coarse sand
Average (Geometric mean)	5.2	--

Notes:
- Geometric mean is calculated instead of the arithmetic mean (average) because hydraulic conductivity values typically follow the log normal distribution (Freeze and Cherry, 1979, p. 31).

The average (geometric mean) hydraulic conductivity is 5.2 feet/day. The higher conductivities are common for sands and gravels and the lower conductivity values are as result of higher compaction in these materials. Spreadsheets used for data reduction and calculation of hydraulic conductivities are presented in Appendix C.

2.4.5 Groundwater Flow Rate

The Darcy equation, modified for calculating groundwater flow, was used to estimate current groundwater flow rates based on June 21, 1989 water level data. The equation used is provided below:

$$\bar{V} = \frac{Ki}{Ne} \qquad \frac{(5.2)\,(0.045)}{0.2}$$

Where $\bar{V}$ is the average groundwater velocity (feet/day), K is the average (geometric mean) hydraulic conductivity (feet/day), i is the hydraulic gradient (ft/ft). Ne is the effective porosity which is estimated using a conservative value of 20 percent for sand and gravel (Walton, 1985). The calculated rate of groundwater flow in the perched water table is approximately 1.2 foot/day.

2.5 ANALYTICAL RESULTS

The following sections present the procedures used to collect groundwater and surface water samples, the analytical methods used to identify and quantify selected chemical parameters and assessment of the analytical results.

2.5.1 Sampling and Analytical Procedures

Groundwater and surface water samples were collected on June 21, 1989, and submitted for analysis to Industrial and Environmental Analysts (IEA) at Essex Junction, Vermont.

To assure representative groundwater, each well was purged until temperature and specific conductivity stabilized to less than 10 percent variation in the discharge. All groundwater samples were collected with a

teflon bailer lowered to the base of each monitoring well and raised to the top. All measurements were recorded in bound field notebooks.

All groundwater and surface water collected was poured into sample containers provided by IEA. Groundwater samples collected for analysis of dissolved metals were filtered through a 45 micron pore size filter prior to preservation with nitric acid to less than pH 2. A composite sample was collected from MW-2, MW-3, and MW-3D in accordance with the work plan approved by the State of Vermont for analysis of the herbicides 2,4-D and 2,4,5-TP. Compositing the sample is valid considering that if 2,4-D is present at 35 parts per billion (ppb) (the State of Vermont Preventative Action Limit), in any of the three monitoring wells, it would not go undetected. Should 2,4-D be detected, than individual samples would be submitted for analysis.

To avoid potential cross contamination of samples, bailers decontaminated and rope replaced prior to purging each well. Bailers were decontaminated with Alconex wash followed by a distilled water rinse, a methanol rinse and three distilled water rinses.

Integrity of the decontamination procedures is determined by collection of two field blanks (final rinsewater from the bailers). To determine if there was any sample cross contamination during shipment, a sample of distilled water was collected at the site and kept in the ice chest used for sample storage. This sample replaced the trip blank normally submitted by the laboratory. Chain of custodies were completed after sample collection and kept in the custody of sampling team members until delivery to IEA.

2.5.2 Groundwater Analytical Results

All groundwater and surface water samples were analyzed by IEA. The herbicides 2,4-D and 2,4,5-TP were determined using United States Environmental Protection Agency (USEPA) Method 509B specified under the Safe Water Drinking Act. Two groundwater samples are collected for analyses of 2,4-D and 2,4,5-TP in the vicinity of the alleged 2,4-D disposal area: one from MW-1 and a composite of equal volumes from MW-2, MW-3S, and MW-3D.

Groundwater samples collected from monitoring wells MW-4, MW-5, MW-6, and MW-7 located in the vicinity of the AOT landfill, and surface water collected along Mendon Brook were collected and analyzed for the following parameters: volatile organic compounds (USEPA Method 601/602), and selected indicator parameters (chloride, chromium, iron, lead, manganese, pH, specific conductance, and total organic carbon). Additionally, the quality assurance/quality control field blanks were analyzed for the same compounds. The blank of distilled water collected at the site to replace the trip blank was analyzed for volatile organic compounds (USEPA Method 601/602).

Analytical reports results are provided in Appendix D. The following sections describe the analytical results in reference to groundwater quality at the alleged 2,4-D area, AOT landfill, and surface water along Mendon Brook.

2.5.3 Alleged 2,4-D Area

Groundwater collected from monitoring wells located in the alleged 2,4-D area were analyzed for the herbicides 2,4-D and 2,4,5-TP. The analytical results, summarized in Table 2-3, indicated that concentrations for both herbicides were below the method detection limit in the upgradient well (MW-1) and the composite sample (MW-2, MW-3S and MW-3D). For 2,4-D, the method detection limit is 0.002 milligrams per liter (mg/ℓ) which is equivalent to 2 parts per billion (ppb). This is below the State of Vermont Preventative Action Limit of 0.035 mg/ℓ (35 ppb).

Compositing samples from MW-2, MW-3S, and MW-3D results in a potential dilution factor of three. If, for example, 2,4-D was at 35 ppb, (Preventative Action Limit) in one sample and the other two samples were clean, 2,4-D should be diluted to approximately 12 ppb, which is clearly above the 2 ppb detection limit for 2,4-D. If the concentrations was below 6 ppb, in this situation, 2,4-D would not be detected in the composite.

The herbicide 2,4,5-TP which is a breakdown product of 2,4-D was also not detected. The method detection limit 2,4,5-TP is 0.0004 mg/ℓ (0.4 ppb) which is below the State of Vermont Preventative Action Limit of 0.005 mg/ℓ (5 ppb).

Table 2-3
VERMONT AGENCY OF TRANSPORTATION
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS – ALLEGED 2,4-D AREA

Sample Identification	Monitoring Well Identification	Herbicides (EP Tox)	
		2,4-D	2,4,5-TP
AOTM-GW1-006	MW-1	BQL (0.002)	BQL (0.004)
AOTM-GW2/3-007	MW-2, MW-3S, MW-3D	BQL (0.002)	BQL (0.0004)
Water Quality Standard	--	0.035(1)	0.005(1)

NOTES:

All concentrations reported in milligrams per liter (mg/l).

All samples were collected on June 21, 1989, and analyzed by Industrial & Environmental Analysts, Inc.

BQL = Below Quantitation Limit with the limit specified in parenthesis

Water Quality Criteria

(1) State of Vermont Primary Groundwater Quality Standards, Preventative Action Limits. Chapter 12 Groundwater Protection Rule and Strategy, 1988.

2.5.4 AOT Landfill

Groundwater was collected from monitoring wells located upgradient (MW-4) and downgradient (MW-5, MW-6 and MW-7) from the AOT landfill. The analytical results are shown on Table 2-4.

The following provides a brief summary of the analytical results for the groundwater quality samples:

- pH values ranged form 6.11 to 6.39 standard units.
- Specific conductance values ranged from 313 to 894 micromhos per centimeter at 25 degrees Celcius.
- Chloride concentrations ranged from 30.7 to 192 milligrams per liter (mg/ℓ).
- Manganese concentrations ranged from less than 0.01 to 1.13 mg/ℓ.
- Chloroform concentrations ranged from 0.0013 to 0.0038 mg/ℓ.
- Total organic carbon concentrations ranged from 2.1 to 52 mg/ℓ.

The highest concentrations of chloride and manganese, pH, and specific conductivity values were detected in monitoring well MW-7. The chloride (192 mg/ℓ) and manganese concentrations (1.13 mg/ℓ) exceeds the State of Vermont Secondary Groundwater Quality Standards Preventive Action Limits. These Preventive Action Limits are 125 mg/ℓ for chloride and 0.025 mg/ℓ for manganese.

Elevated chloride dissolved in groundwater in monitoring well MW-7 is located downgradient from the AOT landfill. Chloride is a conservative anion and migrates at approximately the same rate as groundwater flow. Therefore, elevated chloride may represent the leading edge of a contaminant plume.

Chloroform was detected in all of the groundwater quality samples. In general, the chloroform concentrations are higher at the downgradient monitoring well locations than at the upgradient monitoring well location. Concentrations ranged from 0.0013 to 0.0038 mg/ℓ which is below the USEPA Maximum Contaminant Level (MCL) concentration for chloroform. The MCL for chloroform is 0.10 mg/ℓ and is based on total trihalomethanes (sum of

Table 2-4
VERMONT AGENCY OF TRANSPORTATION
SUMMARY OF COMPOUNDS DETECTED IN GROUNDWATER (AOT LANDFILL) AND SURFACE WATER SAMPLES

Sample Identification	Monitoring Location	Chloroform**	Dissolved Iron*	Dissolved Manganese*	Chloride	pH	Specific Conductance micromhos @25°C	Total Organic Carbon
AOTM-GW-4-001	MW-4	0.0017	BQL (0.025)	BQL (0.01)	65.9	6.11	313	2.1
AOTTM-GW-5-003	MW-5	0.0024	BQL (0.025)	BQL (0.01)	30.7	6.35	447	52
AOTM-GW-6-002	MW-6	0.0038	BQL (0.025)	BQL (0.01)	97.8	6.35	600	38
AOTM-GW-7-004	MW-7	0.0013	BQL (0.025)	1.13	192	6.39	894	46
AOTM-SW-UP-001	SW-1	0.0015	0.136	0.028	19.6	7.14	154	12
AOTM-SW-DOWN-002	SW-1	0.0015	0.128	0.024	20.3	7.21	159	12
AOTM-GW-FB-005* AOTM-GW-FB-008	–	0.0016/ BQL (0.001)	–	BQL (0.01) BQL (0.01)	BQL (0.5) BQL (0.5)	5.06 4.46	1.47 1.38	0.69 0.43
Trip Blank*	–	0.0017	–	–	–	–	–	–
Water Quality Standards	–	0.10(1)	0.15(3)	0.025(3)	125(2)	6.5 – 8.5(4)	–	–

NOTES:

Concentrations reported in milligrams per liter (mg/l) except for pH (standard units) and specific conductance (micromhos at 25°C)

BQL = Below Quantitation Limit

All samples were analyzed by Industrial and Environmental Analysts, Inc.

Samples were collected on June 21, 1989. Additionally, because of sample breakages at the laboratory, Station SW-2 was resampled on July 7, 1989.

* Xylenes (total) were also detected in the trip blank at 0.0017 mg/l and in the field blank (AOTM-GW-FB-005) at 0.002 mg/l.

** Chloroform is also detected in the laboratory method blank at 0.001 to 0.002 mg/l.

Water Quality Standards:

(1) USEPA Maximum Contaminant Level concentration. Water quality criteria based on total trihalomethanes (sum of bromodichloromethane, dibromochloromethane, bromoform, and chloroform). A more stringent USEPA water quality concentrations of 0.00019 parts per million is also used and is based on 1×10^{-6} risk of cancer.

(2) State of Vermont Primary Groundwater Quality Standards, Preventive Action Limit - Chapter 12 Groundwater Protection Rule and Strategy, 1988.

(3) State of Vermont Secondary Groundwater Quality Standards, Preventive Action Limit - Chapter 12 Groundwater Protection Rule and Strategy, 1988.

(4) USEPA Secondary Maximum Contaminant Levels, 1979, Code 40 Federal Regulations, Part 143 National Secondary Drinking Water Regulations.

bromodichloromethane, dibromochloromethane, bromoform, and chloroform). A more stringent USEPA water quality criteria of 0.0019 mg/ℓ is based on a 1×10^{-6} risk of cancer.

A chloroform contamination problem may exist at the site, however, it has also been detected in the laboratory method blank (1-2 ppb), field blank (1.6 ppb) and trip blank (1.7 ppb). The quantitation detection limit for chloroform is approximately 1 ppb. The level of chloroform detected in the laboratory is similar to that detected in the field and trip blanks, surface water along Mendon Brook, and groundwater collected from monitoring wells MW-4 and MW-7. Therefore, chloroform levels detected in groundwater collected from monitoring wells MW-5 (2.4 ppb) and MW-6 (3.8 ppb) may be present, however, because it is present in field, trip and method blanks, it is difficult to be certain.

No other contaminants analyzed were detected in groundwater.

2.5.5 Surface Water Analytical Results

Surface water samples were collected on June 21, 1989 at stations upgradient (SW-1) and downgradient (SW-2) of the site (see Figure 2-3). Samples were collected by vertically immersing the sample containers in the stream in a manner to avoid over topping. SW-2 was resampled on July 7, 1989, after Wehran was advised that the original sample was damaged in the laboratory. Both upstream and downstream samples were analyzed for the same parameters as the AOT landfill: chloride, chromium, iron, lead, manganese, pH, specific conductance, total organic carbon, and volatile organic compounds.

A brief summary of the analytical results from Mendon Brook follow:

- pH ranged from 7.14 standard units (upstream) to 7.21 standard units (downstream).
- Specific conductance measurements ranged from 154 micromhos (upstream) to 159 micromhos (downstream).
- Chloride concentrations ranged from 19.6 mg/ℓ (upstream) to 20.3 mg/ℓ (downstream).

- Dissolved manganese concentrations ranged from 0.028 mg/ℓ (upstream) to 0.024 mg/ℓ (downstream).
- Dissolved iron concentrations ranged from 0.136 mg/ℓ to 0.128 mg/ℓ, upstream and downstream, respectively.
- Chloroform concentrations equaled 0.0015 mg/ℓ at both upstream and downstream locations.
- Total organic carbon concentrations equaled 12 mg/ℓ both upstream and downstream.

Based on comparison of the upstream and downstream samples, their appears to be no significant impacts to Mendon Brook water quality.

2.5.6 Migration and Fate of 2,4-D

2,4-D, also called Amidox, Amoxona, or Aqua Kleen, is a common herbicide which has been widely used to control broadleaf plants. According to the USEPA, 2,4-D is not considered to be a persistent compound within the environment. The reported half life of 2,4-D is 1 to 6 weeks in soils, and a few days to several months in surface waters.

2,4-D rapidly dissociates from an amine or ester, in neutral soils, to an acid. The 2,4-D acid is highly mobile in soil pore water. Therefore, it will likely migrate though soil, and will not significantly adsorb to the soil particles. The solubility of 2,4-D in water ranges from 500 to 900 mg/ℓ. However, as noted, 2,4-D rapidly biodegrades rendering it unlikely to contaminate groundwater (USEPA, 1987).

The specific gravity of 2,4-D is 1.416 grams/cm^3. This indicates that once present within the groundwater, 2,4-D has the potential to migrate downward though the water column. In the case of the AOT site, it would be expected that 2,4-D would be found on top of the glacial till in the sand and gravel unit. Two monitoring well (MW-2 and MW-3D) located at estimated downgradient locations from the alleged 2,4-D disposal area, are screened just above the base of the glacial till to monitor migration of 2,4-D contamination.

3.0 SUMMARY AND CONCLUSIONS

The results of the environmental assessment conducted by Wehran at the AOT maintenance area located along Route 4 in Mendon, Vermont are summarized below.

The terrain conductance survey conducted at the alleged 2,4-D area indicated the presence of buried metallic waste. The waste exposed included domestic waste (such as food cans) empty five gallon paint cans, and an occasional 55-gallon drum. All cans and drums were highly rusted and in many cases, would fall apart when disturbed. Because of the variety of metal present, it was impossible to differentiate between drums and other metallic waste potentially buried.

Terrain conductance was also used to delineate the approximate extent of the AOT landfill. At the landfill mound, anomalous conductivity readings suggests the presence of buried metal. An area of elevated conductivity may represent the presence of salts dissolved in soil moisture and shallow groundwater, dispersed metal debris, or possibly other conductive wastes.

The generalized subsurface stratigraphy encountered during the drilling program consists generally of loose to moderately compact sands and gravels underlain by very dense, moderately to highly compacted silty sands with some gravel (glacial till). Sands and gravels were identified in each of the eight test borings based on classification of soil samples recovered from split spoon and estimated material density at five foot intervals. Based on knowledge of the regional geology and differences in the texture of subsurface materials, coarse glacial sands and gravels were distinguished from finer, more compact, glacial tills.

Groundwater is found perched above the compact glacial till in the region. During the site investigation, groundwater occurred at depths ranging from 0.7 foot to 43.2 feet below land surface.

Saturated thickness of the perched sand and gravel aquifer ranged from 4.1 feet to 14.8 feet, based on water level measurements on June 21, 1989. The water table surface slopes toward Mendon Brook. The contact between the sand and gravel and the underlying glacial till also

slopes toward Mendon Brook. Therefore, the direction of groundwater flow is influenced by the dip of the glacial till surface. The rate of groundwater flow is 1.2 feet per day based on a calculated value for hydraulic gradient, average hydraulic conductivity and a conservative published value for effective porosity.

At the AOT landfill, compounds detected in groundwater collected on June 21, 1989: chloride, chloroform, and manganese. Compounds not detected were chromium, iron, lead, and VOCs (other than chloroform). Concentrations of chloride and manganese exceed State of Vermont Primary and Secondary groundwater quality standards, respectively. Indicator parameters (specific conductance and TOC) are elevated downgradient form the landfill. Elevated chloride in monitoring well MW-7 may represent the leading edge of a groundwater contaminant plume.

Surface water samples were analyzed for the same parameters as groundwater in the vicinity of the landfill. Surface water collected in Mendon upstream and downstream from the landfill contained chloride, chloroform, iron, and manganese. Compounds not detected were chromium and lead. Based on the similarity in concentrations of water quality parameters upstream and downstream, there appears to be no significant impacts to Mendon Brook from the landfill.

Numerous studies have shown the 2,4-D is readily biodegraded by microorganisms which are prevalent in the environment and that microbial activity is the predominant factor effecting decay in soils. Most reported half-lives for the biodegradation of 2,4-D in soils range from a few days to a few weeks, with more than 90 percent degradation within a few months.

In conclusion, based on a summary of the results of the environmental assessment, there appears to be no significant impacts, at this time, to groundwater or surface water, resulting from disposal of 2,4-D from the alleged area. Although past disposal practices at the AOT Mendon facility may have caused elevated chloride and manganese concentrations, this occurs at only one groundwater monitoring location and does not affect Mendon Brook. The shallow groundwater at the site is not considered as a water supply, therefore the elevated levels of chloride do not pose a health risk. Elevated concentrations of chloride are objectionable only from the

characteristic of taste. Dissolved manganese is generally below detection limits, and the fact that it exceeds preventative action limits at one groundwater monitoring location is considered to be not significant at this time. Manganese is a naturally occurring element and is present in Mendon Brook upstream from the facility. Observed elevated TOC concentrations may result from natural organic matter dissolved in groundwater or elevated concentrations of synthetic organic compounds excluding volatile organics (EPA Methods 601 and 602), which were undetected in groundwater near the AOT landfill and surface water along Mendon Brook.

4.0 RECOMMENDATIONS

Based on the conclusions of this environmental assessment of the AOT Mendon facility, there does not appear to be any negative impacts by pesticides, metals or volatile organics. For this reason, Wehran Engineering does not recommend any additional groundwater or surface water sampling for these compounds at this time. The elevated concentrations of total organic carbon (TOC) may, however, be indicative of semi-volatile organic contamination. If, however, the AOT would like to identify constituents in the TOC, Wehran could recommend an additional round of groundwater and surface water sampling for semi-volatiles (acid and base neutral extractable organic compounds in accordance with EPA Method 625) and a confirmatory analysis of volatile organic compounds (EPA Methods 601 and 602).

5.0 REFERENCES

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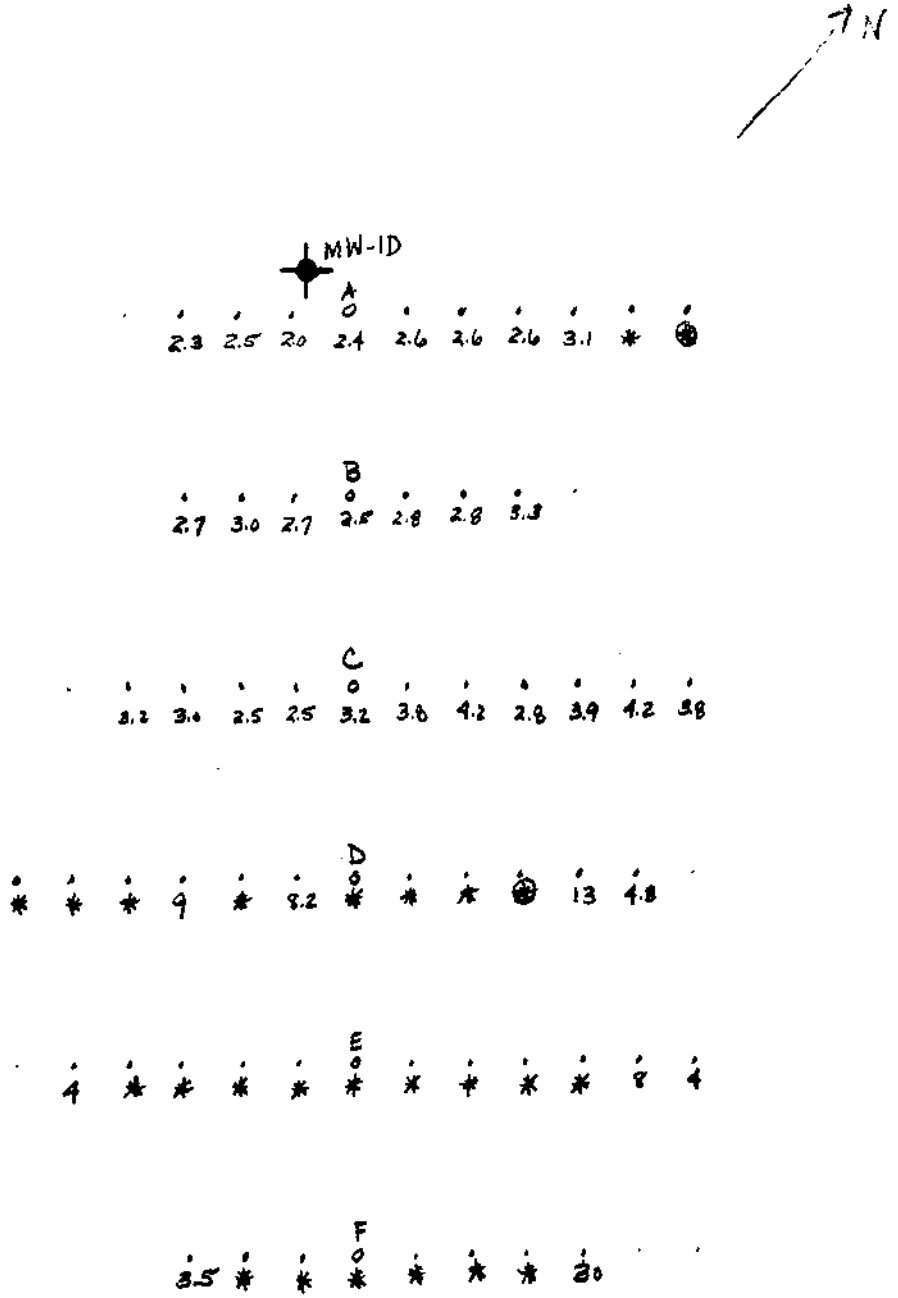
APPENDIX A

TERRAIN CONDUCTANCE DATA

Lyla Wisted by
By [illegible] Date 9/22/89
Chkd. by COR Date 9/22/89
Subject A.O.T. Nienow Sampling Grid for EM-31 Geophysical Survey
Alleged 2.4-D Disposal Area

WehranEnviroTech

Job No. 09424 #F
Sheet No. 1 of 2



MW1D - Approximate location of MW1D

1 = 50'

* - Off-scale - negative value

* Off-scale - negative value - refuse observed

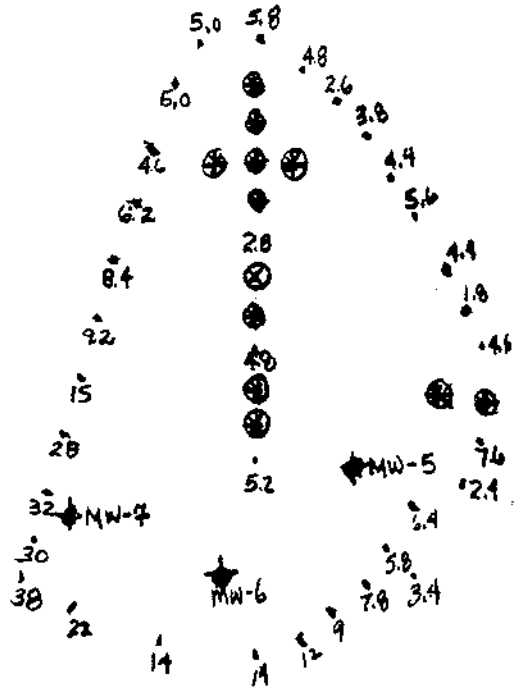
Units in micromhos/meter

data collected by:
By E. Butler Date 9/26/89
Chkd. by CPE Date 9/26/89

WehranEnviroTech

Job No. 09494.HF
Sheet No. 2 of 2

Subject A.O.T Meadow - Sampling Grid for EM-31 Survey Conducted at On-Site Landfill 5/18/89



⊗ off-scale value
◆ MW-6 Location of monitoring well

values recorded in mmhos/meter

Scale
1" = 100'

APPENDIX B

TEST BORING LOGS AND MONITORING WELL CONSTRUCTION DIAGRAMS

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG
BORING NO. MW-1

PROJECT : Environmental Site Assessment
CLIENT : Vermont Agency of Transportation (A.O.T.) Mendon
BORING CONTRACTOR : Vermont A.O.T.

SHEET NO. 1 OF 3
JOB NO. 09424.HF
ELEVATION 518.8 FT
DATE STARTED 6/5/89
DATE FINISHED 6/16/89
DRILLER Jim Hartson
INSPECTOR Randi Augustine
Cindy Sprague,

GROUND WATER			
DATE	TIME	WATER EL.	SCREEN
			41-51 FT
			below ground
			surface

	CAS.	SAMP	CORE	TUBE
TYPE	D&W	SS		
DIA.	3"-4"	2"		
WT.		140lb		
FALL		30"		

WELL CONSTRUCTION	DEPTH IN FEET	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS Recovery	REMARKS HNU Headspace (ppm)
⑥	0	S-1	SS	2, 5, 8, 12	Brown medium dense, coarse to fine SAND and coarse to medium GRAVEL	12"	0.2
⑤ ② ⑤	5	S-2	SS	11, 16, 22, 23	Brown, dense, coarse to fine SAND and coarse to medium GRAVEL, some Cobble, trace Silt	10"	0.2
	10	S-3	SS	28, 25, 23, 11	Tan, dense, coarse to medium SAND and coarse Gravel, some fine Sand, trace Silt	6"	0.0
	15	S-4	SS	20, 21, 32, 52/.1'	Tan, very dense coarse to fine SAND and coarse to medium GRAVEL, trace Silt	6"	0.0
	20	S-5	SS	35, 61, 65/.3'	Tan, very dense coarse SAND and GRAVEL, crushed Cobbles, some medium to fine Sand, trace Silt	6"	0.0

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG
BORING NO. MW - 1

PROJECT: Environmental Site Assessment
SHEET NO. 2 OF 3
CLIENT: Vermont Agency of Transportation (A.O.T.) - Mendon
JOB NO. 09424.HF

WELL CONSTRUCTION	DEPTH FEET	SAMPLE NO.	SAMPLE TYPE	SAMPLE BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS Recovery	REMARKS HNU Headspace (ppm)
	25	S-6	SS	23 62 38/.1'	Crushed Cobbles	6"	N.C.
	30				Cobbles		
⑤ ⑤					Boulder (33-35')		
② ④ ④	35	RUN 1	BX	5 min. 5 min.		None	N.A.
		S-7	SS	71 30/.1	Cobble	2"	N.C.
	40	S-8	SS	100/.5'	Crushed Cobble	6"	0.0
		RUN 2	BX	N.C.		No Recovery	N.C.
③ ③ ①	45	S-9	SS	21 46 33/.3'	Tan, very dense fine SAND, little medium Gravel moderately compact (damp)	8"	0.4
	50	S-10	SS	100/.2'	Wash	2"	0.7

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG

BORING NO. MW-1

SHEET NO. 3 OF 3

PROJECT: Environmental Site Assessment

CLIENT: Vermont Agency of Transportation (A.O.T.) - Mendon

JOB NO. 09424.HF

WELL CONSTRUCTION	DEPTH FEET	SAMPLE NO.	SAMPLE TYPE	SAMPLE BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS Recovery	HNU Headspace (ppm)
① ③ ③ ③	50	S-11	SS	100/0.5'	Wash and Quartz fragments	Wash	0.6
④	55	S-12	SS	25 45	Tan, very dense medium SAND, some medium Gravel, not compact (saturated)	6"	0.2
⑦	60	S-13	SS	16 84/0.3'	Brown, very dense tan fine SAND, some fine Gravel, moderately compact (saturated)	4"	0.0
	65	S-14	SS	100/0.5'	Wash - Quartz fragments	Wash	0.1
	70	S-15	SS	35 65/0.4'	Brown, very dense, medium SAND, some fine to medium Gravel loose (saturated)	6"	0.0
	75				END OF BORING AT 70' 10"		

NOTE:
N.C. - Not Collected

* 4" casing to 25 ft.
3" casing to 70 ft

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG

BORING NO. MW-2

SHEET NO. 1 **OF** 2

PROJECT : Environmental Site Assessment

CLIENT : Vermont Agency of Transportation (A.O.T.) - Mendon

JOB NO. 09424.HF

BORING CONTRACTOR : Vermont A.O.T.

ELEVATION 483.8 PT

DATE STARTED 6/5/89

DATE FINISHED 6/8/89

DRILLER Bob

INSPECTOR Randi Augustine

GROUND WATER

DATE	TIME	WATER EL.	SCREEN
			18-28ft
			below ground
			surface

	CAS.	SAMP.	CORE	TUBE
TYPE	HSA	SS		
DIA.	3 1/8"	2"		
WT.		140lb		
FALL		30"		

WELL CONSTRUCTION	DEPTH FEET	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS Recovery	REMARKS HNU Headspace (ppm)
④ ⑥ ④	0	S-1	SS	4, 6, 10, 13	Brown medium dense coarse to fine SAND and medium to coarse GRAVEL (dry)	18"	0.5
					Boulder		
⑦ ⑦	5	S-2	SS	16, 13, 16, 15	Brown/Tan, medium dense coarse to fine SAND, some coarse to medium GRAVEL, Crushed Cobble (moist)	13"	0.5
②							
	10	S-3	SS	14, 20, 20, 26	Brown, dense, coarse to fine SAND, and coarse to medium GRAVEL (dry to moist)	12"	0.5
④ ④							
	15	S-4	SS	23, 47, 44, 50	Brown/Tan, very dense, coarse to fine SAND and coarse to medium GRAVEL, some darker brown staining at 15.6 ft. (moist)	15"	0.2
③ ① ③	20	S-5	SS	41, 105	Brown, very dense, coarse to fine SAND, some Gravel (angular), Cobble, some to trace Silt (saturated)	12"	N.C.
					Boulder		

NOTE:
N.C. - Not Collected

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG
BORING NO. MW - 2

PROJECT: Environmental Site Assessment
SHEET NO. 2 OF 2
CLIENT: Vermont Agency of Transportation (A.O.T.) - Mendon
JOB NO. 09424.HF

WELL CONSTRUCTION	DEPTH FEET	SAMPLE NO.	SAMPLE TYPE	SAMPLE BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS Recovery	REMARKS HNU Headspace (ppm)
③ ① ③	25	S-6	SS	51 / 60/2"	Tan very dense, medium to fine SAND, some Gravel, some to trace Silt (wet), Boulder	6"	N.C.
③		S-7	SS	100/3"	Tan/Gray very dense fine SAND and Silt, trace Gravel dry to moist (Glacinl TILL)	2"	N.C.
	30				END OF BORING AT 28.5 FT		
	35						
	40						
	45						
	50						

NOTE:
N.C. - Not Collected

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG

BORING NO. MW - 3S

PROJECT : Environmental Site Assessment

CLIENT : Vermont Agency of Transportation (A.O.T.) - Mendon

BORING CONTRACTOR : Vermont A.O.T.

SHEET NO. 1 OF 1

JOB NO. 09424.HF

ELEVATION 461.4 FT

DATE STARTED 6/14/89

DATE FINISHED 6/15/89

DRILLER Elmer/Bob

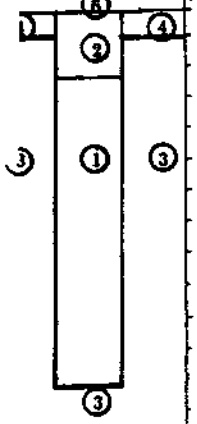
INSPECTOR Cynthia Sprague

GROUND WATER

DATE	TIME	WATER EL.	SCREEN
			1-6 ft
			below grade
			surface

	CAS.	SAMP.	CORE	TUBE
TYPE	HSA	SS		
DIA.	3 1/8"ID	2"		
WT.		140lb		
FALL		30"		

WELL CONSTRUCTION



DEPTH FEET	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS
0				See MW - 3D -No samples collected for this boring	
5					
				END OF BORING AT 7 FT	
10					
15					
20					

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG
BORING NO. MW - 3D

PROJECT	Environmental Site Assessment
CLIENT	Vermont Agency of Transportation (A.O.T.) - Mendon
BORING CONTRACTOR	Vermont A.O.T.
SHEET NO.	1 OF 1
JOB NO.	09424.HF
ELEVATION	461.4 FT
DATE STARTED	6/12/89
DATE FINISHED	6/14/89
DRILLER	Bob/Elmer
INSPECTOR	Randi Augustine/ Cindy Sprague

GROUND WATER DATE	TIME	WATER EL.	SCREEN
			10-15 ft below ground surface

	CAS.	SAMP	CORE	TUBE
TYPE	HSA	SS		
DIA.	3 1/8"ID	2"		
WT.		140lb		
FALL		30"		

WELL CONSTRUCTION	DEPTH IN FEET	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS Recovery	REMARKS HNU Headspace (ppm)
⑥ ② ④ ④ ① ③ ③ ③ ④ ⑦	0	S-1	SS	1 1 12 16	Peat (0-10") Medium dense coarse GRAVEL, some dark brown Silt, organics (10" - 12")	12"	0.0
					Boulder		
	5	S-2	SS	12 21 29 34	Gray/Brown, dense SILT and fine SAND	16"	0.0
	10	S-3	SS	13 27 52 73	Gray/Brown, very dense, fine SAND, some Silt (0 -12") Gray, fine SAND and SILT, some crushed Cobble, Gravel (not compact)	15"	0.0
	15	S-4	SS	72 105/0.2	Gray/Brown, very dense, medium to fine SAND, some Gravel, crushed Cobble, trace Silt (moderately compacted) TILL	6"	0.0
	20	S-5	SS	10 73 101	Very dense, medium to fine SAND, some coarse SAND, Gravel, trace Silt, (moderately compact) TILL	12"	0.0
				26 35 100/0.2	Gray, very dense fine SAND, some fine to medium Subangular Gravel, little Silt. TILL	7"	0.2
					END OF BORING AT 22.5 FT		

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG
BORING NO. MW - 4

PROJECT : Environmental Site Assessment
CLIENT : Vermonc Agency of Transportation (A.O.T.) - Mendon
BORING CONTRACTOR : Vermont A.O.T.

SHEET NO. 1 OF 1
JOB NO. 09424.HF
ELEVATION 497.0
DATE STARTED 5/31/89
DATE FINISHED 5/31/89
DRILLER Jim Hartson
INSPECTOR Gwenn Buttles

	CAS.	SAMP.	CORE	TUBE
TYPE	HSA	SS		
DIA.	3 1/8"ID	2"		
WT.		140lb		
FALL		30"		

GROUND WATER

DATE	TIME	WATER EL.	SCREEN
			6-15 ft
			below ground
			surface

WELL CONSTRUCTION	DEPTH FEET	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS Recovery	REMARKS HNU Headspace (ppm)
⑥ ④ ② ④	0	S-1	SS	2, 5, 6, 5	Light Brown, medium dense, coarse to fine SAND, some fine Gravel (dry)	16"	0.0
	5	S-2	SS	4, 3, 3, 4	Light Brown, l oose, medium SAND, little fine Sand, trace coarse Sand - clean (dry)	16"	0.0
③ ① ③	10	S-3	SS	1, 2, 2, 16	Light Brown, loose, fine SAND, some Silt (saturated)	14"	0.0
					Boulder		
	15	S-4	SS	12, 17, 14, 16	Light Brown, dense, coarse SAND and GRAVEL, moderately compact	14"	N.C.
⑦					END OF BORING AT 17 FT		
	20				NOTE: N.C. - Not Collected		

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG

BORING NO. MW-5
SHEET NO. 1 OF 2
JOB NO. 09424.HF
ELEVATION 481.6 ft
DATE STARTED 6/2/89
DATE FINISHED 6/2/89
DRILLER Jim Hartson
INSPECTOR Gwenn Buttles

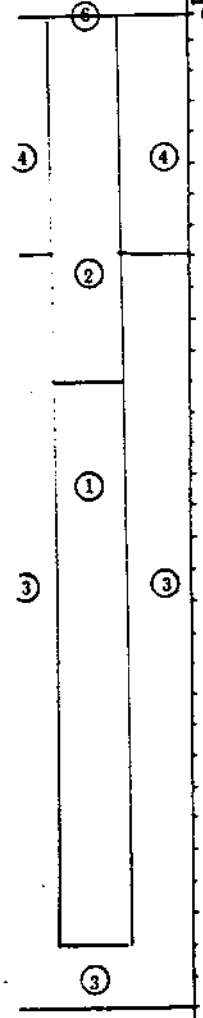
PROJECT : Environmental Site Assessment
CLIENT : Vermont Agency of Transportation (A.O.T.) – Mendon
BORING CONTRACTOR : Vermont A.O.T.

	CAS.	SAMP.	CORE	TUBE
TYPE	HSA	SS		
DIA.	3 1/8"ID	2"		
WT.		140lb		
FALL		30"		

GROUND WATER

DATE	TIME	WATER EL.	SCREEN
			6-15ft
			below grade
			surface

WELL CONSTRUCTION



DEPTH FEET	NO.	TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	Recovery	HNU Headspace (ppm)
0	S-1	SS	7, 15, 12, 13	Light Brown, medium dense, medium to fine SAND and fine GRAVEL loose (dry)	13"	0.0
				Black stained soil (4')		
5	S-2	SS	3, 4, 6, 4	Fine, loose GRAVEL and Coarse SAND (dry) (5.0–5.5') Light Brown, medium dense, coarse to fine SAND (moist) (5.5–7.0)	19"	0.0
10	S-3	SS	3, 4, 6, 7	Brown, loose, medium to fine SAND, coarse Sand little Silt (saturated)	16"	0.0
15	S-4	SS	3, 3, 5, 11	Loose, fine SAND and SILT (saturated)	22"	0.0
20	S-5	SS	9, 5, 6, 6	Medium dense GRAVEL and some SILT, some fine SAND (saturated)	12"	0.0

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG
BORING NO. MW-5

PROJECT: Vermont Agency of Transportation (A.O.T.) - Mendon
SHEET NO. 2 OF 2
CLIENT: Vermont A.O.T.
JOB NO. 09424.HF

WELL CONSTRUCTION	DEPTH FEET	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS Recovery	REMARKS HNU Headspace (ppm)
⑦	25			35 73 100/3"	Very dense fine SAND and SILT, some Gravel, dense/compact (moist to dry)-(TILL at 25.5ft)	18"	N.C.
					END OF BORING AT 26' 3".		
	30						
	35						
	40						
	45						
	50						

NOTE:
N.C. - Not Collected

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG

BORING NO. MW-6
SHEET NO. 1 OF 1
JOB NO. 09424.HF
ELEVATION 480.2 FT
DATE STARTED 6/1/89
DATE FINISHED 6/1/89
DRILLER Jim Hartson
INSPECTOR Gwenn Buttles

PROJECT : Environmental Site Assessment
CLIENT : Vermont Agency of Transportation (A.O.T.) - Mendon
BORING CONTRACTOR : Vermont A.O.T.

	CAS	SAMP	CORE	TUBE
TYPE	HSA	SS		
DIA.	3 1/8"ID	2"		
WT.		140lb		
FALL		30"		

GROUND WATER

DATE	TIME	WATER EL.	SCREEN
			6-15 ft
			below grade
			surface

WELL CONSTRUCTION	DEPTH FEET	NO.	TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS Recovery	HNU Headspace (ppm)
⑥ ④ ② ③ ① ③ ⑦	0	S-1	SS	– 14 14 17	Light Brown, medium dense, coarse to medium SAND, some Gravel (dry)	19"	0.0
	5	S-2	SS	13 19 24 18	Light brown, medium, very dense, fine SAND, little to trace Silt (moist)	15"	0.0
	10	S-3	SS	2 4 4 5	Light Brown, loose, coarse SAND, some to little medium Sand, trace Silt (saturated)	18"	0.0
	15	S-4	SS	3 2 3 3	Light Brown, loose, coarse SAND, clean (15-16') Light Brown, fine SAND and SILT (16-17') (saturated)	13"	0.0
					END OF BORING AT 17 FT		
	20						

WEHRAN ENGINEERING
CONSULTING ENGINEERS

TEST BORING LOG

BORING NO. MW - 7

PROJECT :	Environmental Site Assessment
CLIENT :	Vermont Agency of Transportation (A.O.T.) - Mendon
BORING CONTRACTOR :	Vermont A.O.T.
SHEET NO.	1 OF 1
JOB NO.	09424.HF
ELEVATION	479.9 FT
DATE STARTED	6/1/89
DATE FINISHED	6/1/89
DRILLER	Jim Hartson
INSPECTOR	Gwenn Buttles

GROUND WATER

DATE	TIME	WATER EL.	SCREEN
			6-16 ft
			below ground
			surface

	CAS.	SAMP.	CORE	TUBE
TYPE	HSA	SS		
DIA.	3 1/8" ID	2"		
WT.		140lb		
FALL		30"		

WELL CONSTRUCTION	DEPTH FEET	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6 INCHES	CLASSIFICATION	REMARKS Recovery	REMARKS HNU Headspace (ppm)
⑥ ④ ② ④	0	S-1	SS	1, 2, 4, 5	Light Brown, loose, coarse to fine SAND, little fine Gravel (dry to moist)	14"	0.0
	5	S-2	SS	5, 54, 20, 39	Light Brown, very dense, coarse to fine SAND, some to little Gravel, little Silt (saturated to moist) Boulder at 5.5'	9"	0.0
③ ① ③	10	S-3	SS	2, 5, 10, 5	Light Brown, medium dense, coarse to medium SAND, some fine Sand (saturated)	15"	0.0
	15	S-4	SS	3, 5, 6, 7	Light Brown, medium dense, fine SAND and SILT (saturated)	10"	N.C.
⑦					END OF BORING AT 17 FT		
	20						

NOTE:
N.C. - Not Collected

APPENDIX C

HYDRAULIC CONDUCTIVITY SPREADSHEETS

GEOMETRIC MEAN CALCULATION OF HYDRAULIC CONDUCTIVITIES

ADJ MENDON

MONITORING WELL IDENTIFICATION	HYDRAULIC CONDUCTIVITY (feet/day)	LOGARITHMS (base 10)
MW-2	4.5	0.653213
MW-3S	3.1	0.491361
MW-3D	0.84	-0.07572
MW-4	7.12	0.852479
MW-5	5.41	0.733197
MW-6	9.56	0.980457
MW-7	22.39	1.350054
		0.712148 LOG AVERAGE
		5.2 GEOMETRIC MEAN (INVERSE LOG OF LOG AVERAGE)

SLUG TEST - AGT MENDON - Mw-2

AQUIFER SLUG TESTING WORKSHEET VERSION 2.1

TEST DOCUMENTATION	VALUE
DATE	7/07/89
WELL ID	AGT/M-Mw-2
WELL DIAMETER (IN)	2
BOREHOLE RADIUS (IN)	5
TOTAL DEPTH OF WELL (FEET)	28
STATIC WATER LEVEL BELOW TOP OF WELL	21.73
REFERENCE WATER LEVEL	21.72
TYPE OF AQUIFER	UNCONFINED
HERMIT TEST NO.	6
EST. ELAPSED TIME SLUG REMOVED	0.05
VOLUME OF SLUG (GAL)	0.22
INSTANTANEOUS HEAD CHANGE (FT)	1.98
DEPTH OF HEAD CHANGE (FT BELOW TOC)	23.70
DEPTH TO BASE OF WELL SCREEN (FT BELOW TOC)	30.75
HEIGHT OF SCREEN THROUGH WHICH WATER ENTERS, L (FEET)	9.03
DEPTH OF BASE OF SCREEN - DEPTH TO WATER, H (FEET)	9.03

$ CORRECTED FOR TIME SLUG REMOVED & OSCILLATION IN W.L.
OSCILLATION OF WATER LEVEL ENDED.

RECORDED E.T. (MIN)	RECORDED WL (FT)	CHANGE IN DEPTH (FT)		CRCTD$ E.T. (MIN)	CRCTD$ E.T. (SEC)	CRCTD$ HEAD CHG (FT)	H/HO
0.0000	21.72	0.00		0.0000	0.00	1.98	1.00
0.0033	21.72	0.00		0.0500	3.00	1.74	0.88
0.0066	21.72	0.00		0.0666	4.00	1.63	0.82
0.0099	21.72	0.00		0.0833	5.00	1.51	0.76
0.0133	21.72	0.00		0.1000	6.00	1.42	0.72
0.0166	21.72	0.00		0.1166	7.00	1.32	0.67
0.0200	21.72	0.00		0.1333	8.00	1.23	0.62
0.0233	21.72	0.00		0.1500	9.00	1.14	0.58
0.0266	21.72	0.00		0.1666	10.00	1.04	0.53
0.0300	21.72	0.00		0.1833	11.00	0.96	0.49
0.0333	21.72	0.00		0.2000	12.00	0.89	0.45
0.0500	22.44	0.72		0.2166	13.00	0.82	0.41
0.0666	21.99	0.27		0.2333	14.00	0.76	0.38
0.0833	23.43	1.71		0.2500	15.00	0.69	0.35
0.1000	23.46	1.74	$$	0.2666	16.00	0.63	0.32
0.1166	23.35	1.63		0.2833	17.00	0.59	0.30
0.1333	23.23	1.51		0.3667	22.00	0.42	0.21
0.1500	23.14	1.42		0.4500	27.00	0.35	0.18
0.1666	23.04	1.32		0.5333	32.00	0.32	0.16
0.1833	22.95	1.23		0.6167	37.00	0.30	0.15
0.2000	22.86	1.14		0.7000	42.00	0.29	0.15
0.2166	22.76	1.04		0.7833	47.00	0.28	0.14

HYDRAULIC CONDUCTIVITY CALCULATION

METHOD: BOUWER AND RICE (1976).

EQUATIONS (for fully penetrating wells):
K = (Rc^2 * (ln(Re/Rw))/2L) * ln(Yo/Yt)* 1/t
Where ln(Re/Rw) = 1 / ((1.1/ln(H/Rw)) + C/(L/Rw))

PARAMETER DEFINITION:

K = Hydraulic conductivity (length/time).
Rc = Well radius (length).
Re = Effective radius over which the slug is dissipates (length).
Rw = Borehole radius (length).
L = Height of screen through which water enters (length).
Yo = H/Ho @ start of test (extrapolated from a semilog graph of H/Ho vs elapsed time (sec.).
Yt = H/Ho at an arbitrarily defined time (t) from the semilog semilog graph previously defined above.
H = Depth to base of screen - depth to water (length).
C = Coefficient determined from Fig. 3 in Bouwer & Rice (1976).

PARAMETER	VALUE	UNITS	
Rc =	0.08	feet	
Rw =	0.50	feet	
L =	9.03	feet	
Yo =	1.00	dimless	(defined from semilog graph)
Yt =	0.53	dimless	(defined from semilog graph)
t =	10.00	sec	(defined from semilog graph)
L =	9.03	feet	
H =	9.03	feet	
L/Rw =	18.06		
C =	1.60	dimless	(defined from Fig. 3 (Bouwer & Rice, 1976)

CALCULATIONS:

ln (Re/Rw) = 2.13

K = 4.50 feet/day

[illegible] TEST - ACT MEADOW - Nw-2

[illegible]	[illegible]	[illegible]	0.8667	52.00	0.27	0.14
[illegible]	[illegible]	[illegible]	0.9500	57.00	0.27	0.14
[illegible]	[illegible]	[illegible]	1.0333	62.00	0.26	0.13
[illegible]	[illegible]	[illegible]	1.1167	67.00	0.26	0.13
[illegible]	[illegible]	[illegible]	1.2000	72.00	0.25	0.13
[illegible]	[illegible]	[illegible]	1.2833	77.00	0.25	0.13
[illegible]	[illegible]	[illegible]	1.3666	82.00	0.25	0.13
[illegible]	[illegible]	[illegible]	1.4500	87.00	0.24	0.12
0.5000	22.07	0.35	1.5333	92.00	0.24	0.12
[illegible]	[illegible]	[illegible]	1.6167	97.00	0.23	0.12
0.6667	22.02	0.30	1.7000	102.00	0.23	0.12
0.7500	22.01	0.29	1.7833	107.00	0.23	0.12
0.8333	22.00	0.28	1.8667	112.00	0.23	0.12
0.9167	21.99	0.27	1.9500	117.00	0.23	0.12
1.0000	21.99	0.27	2.4500	147.00	0.22	0.11
1.0833	21.98	0.26	2.9500	177.00	0.21	0.11
1.1667	21.98	0.26	3.4500	207.00	0.20	0.10
1.2500	21.97	0.25	3.9500	237.00	0.20	0.10
1.3333	21.97	0.25	4.4500	267.00	0.20	0.10
1.4166	21.97	0.25	4.9500	297.00	0.18	0.09
1.5000	21.96	0.24	5.4500	327.00	0.18	0.09
1.5833	21.96	0.24	5.9500	357.00	0.18	0.09
1.6667	21.95	0.23	6.4500	387.00	0.18	0.09
1.7500	21.95	0.23	6.9500	417.00	0.16	0.08
1.8333	21.95	0.23	7.4500	447.00	0.17	0.09
1.9167	21.95	0.23	7.9500	477.00	0.16	0.08
2.0000	21.95	0.23	8.4500	507.00	0.16	0.08
2.5000	21.94	0.22	8.9500	537.00	0.16	0.08
3.0000	21.93	0.21	9.4500	567.00	0.16	0.08
3.5000	21.92	0.20	9.9500	597.00	0.15	0.08
4.0000	21.92	0.20	11.9500	717.00	0.15	0.08
4.5000	21.92	0.20	13.9500	837.00	0.14	0.07
5.0000	21.90	0.18	15.9500	957.00	0.13	0.07
5.5000	21.90	0.18	17.9500	1077.00	0.12	0.06
6.0000	21.90	0.18	19.9500	1197.00	0.11	0.06
6.5000	21.90	0.18	21.9500	1317.00	0.11	0.06
7.0000	21.88	0.16				
7.5000	21.89	0.17				
8.0000	21.88	0.16				
8.5000	21.88	0.16				
9.0000	21.88	0.16				
9.5000	21.88	0.16				
10.0000	21.87	0.15				
12.0000	21.87	0.15				
14.0000	21.86	0.14				
16.0000	21.85	0.13				
18.0000	21.84	0.12				
20.0000	21.83	0.11				
22.0000	21.83	0.11				

SLUG TEST - AOT MENDON - MW-3S

AQUIFER SLUG TESTING WORKSHEET VERSION 2.1

TEST DOCUMENTATION	VALUE
DATE	7/07/89
WELL ID	AOTM-MW3S
WELL DIAMETER (IN)	2
BOREHOLE RADIUS (IN)	6
TOTAL DEPTH OF WELL (FEET)	6
STATIC WATER LEVEL BELOW TOC OF WELL	3.09
REFERENCE WATER LEVEL	3.09
TYPE OF AQUIFER	UNCONFINED
PERMIT TEST NO.	5
EST. ELAPSED TIME SLUG REMOVED	0.0333
VOLUME OF SLUG (GAL)	0.31
INSTANTANEOUS HEAD CHANGE (FT)	1.92
DEPTH OF HEAD CHANGE (FT BELOW TOC)	5.01
DEPTH TO BASE OF WELL SCREEN (FT BELOW TOC)	9.29
HEIGHT OF SCREEN THROUGH WHICH WATER ENTERS, L (FEET)	5.00
DEPTH TO BASE OF SCREEN - DEPTH TO WATER, H (FEET)	6.20

* CORRECTED FOR TIME SLUG REMOVED & OSCILLATION IN W.L.
** OSCILLATION OF WATER LEVEL ENDED.

RECORDED E.T. (MIN)	RECORDED WL (FT)	CHANGE IN DEPTH (FT)		CRCTD* E.T. (MIN)	CRCTD* E.T. (SEC)	CRCTD* HEAD CHG (FT)	H/HO
0.0000	3.09	0.00		0.0000	0.00	1.92	1.00
0.0033	3.09	0.00		0.0500	3.00	1.56	0.81
0.0066	3.09	0.00		0.0667	4.00	1.13	0.59
0.0099	3.09	0.00		0.0833	5.00	0.90	0.47
0.0133	3.10	0.01		0.1000	6.00	0.79	0.41
0.0166	3.09	0.00		0.1167	7.00	0.76	0.40
0.0200	3.09	0.00		0.1333	8.00	0.72	0.38
0.0233	3.09	0.00		0.1500	9.00	0.69	0.36
0.0266	3.11	0.02		0.1667	10.00	0.66	0.34
0.0300	3.09	0.00		0.1833	11.00	0.64	0.33
0.0333	3.07	-0.02		0.2000	12.00	0.61	0.32
0.0500	3.47	0.38		0.2167	13.00	0.59	0.31
0.0666	4.38	1.29		0.2333	14.00	0.58	0.30
0.0833	4.65	1.56	**	0.2500	15.00	0.56	0.29
0.1000	4.22	1.13		0.2667	16.00	0.55	0.29
0.1166	3.99	0.90		0.2833	17.00	0.53	0.28
0.1333	3.88	0.79		0.3000	18.00	0.51	0.27
0.1500	3.85	0.76		0.3824	23.00	0.44	0.23
0.1666	3.81	0.72		0.4667	28.00	0.39	0.20
0.1833	3.78	0.69		0.5500	33.00	0.35	0.18
0.2000	3.75	0.66		0.6334	38.00	0.32	0.17
0.2166	3.73	0.64		0.7167	43.00	0.30	0.16

HYDRAULIC CONDUCTIVITY CALCULATION

METHOD: BOUWER AND RICE (1976).

EQUATIONS (for fully penetrating wells):
K = (Rc^2 * ln(Re/Rw))/2HL * ln (Yo/Yt) * t
Where ln(Re/Rw) = 1 / [1.1/ln(H/Rw) + (C/L)Rw)]

PARAMETER DEFINITION:

K = Hydraulic conductivity (length/time).
Rc = Well radius (length).
Re = Effective radius over which the slug is dissipated (length).
Rw = Borehole radius (length).
L = Length of screen through which water enters (length).
base (length).
Yo = H/Ho @ start of test (extrapolated from a semilog graph of H/Ho vs elapsed time (sec.).
Yt = H/Ho at an arbitrarily defined time (t) from the semilog graph previously defined above.
H = Depth to base of screen - depth to water (length).
C = Coefficient determined from Fig. 3 in Bouwer & Rice (1976).

PARAMETER	VALUE	UNITS	
Rc =	0.08	feet	
Rw =	0.50	feet	
L =	5.00	feet	
Yo =	0.45	dimless	(defined from semilog graph)
Yt =	0.34	dimless	(defined from semilog graph)
t =	10.00	sec	(defined from semilog graph)
L =	5.00	feet	
H =	6.20	feet	
L/Rw =	10.00		
C =	1.05	dimless	(defined from Fig. 3 (Bouwer & Rice, 1976)

CALCULATIONS:

ln (Re/Rw) = 1.85

K = 3.10 feet/day

SLUG TEST - NOT MENDON - MW-3S

0.0333	3.70	0.61	1.3500	48.00	0.28	0.15
0.0500	3.68	0.59	0.8833	53.00	0.27	0.14
0.0666	3.67	0.58	0.9667	58.00	0.26	0.14
0.0833	3.65	0.56	1.0500	63.00	0.24	0.13
0.1000	3.64	0.55	1.1334	68.00	0.23	0.12
0.2166	3.62	0.53	1.2167	73.00	0.22	0.11
0.3333	3.60	0.51	1.3000	78.00	0.21	0.11
0.4167	3.53	0.44	1.3833	83.00	0.20	0.10
0.5000	3.48	0.39	1.4667	88.00	0.16	0.08
0.5833	3.44	0.35	1.5500	93.00	0.15	0.08
0.6667	3.41	0.32	1.6334	98.00	0.18	0.09
0.7500	3.39	0.30	1.7167	103.00	0.16	0.08
0.8333	3.37	0.28	1.8000	108.00	0.15	0.08
0.9167	3.36	0.27	1.8834	113.00	0.15	0.08
1.0000	3.35	0.26	1.9667	118.00	0.13	0.07
1.0833	3.33	0.24	2.4667	148.00	0.11	0.06
1.1667	3.32	0.23	2.9667	178.00	0.08	0.04
1.2500	3.31	0.22	3.4667	208.00	0.06	0.03
1.3333	3.30	0.21	3.9667	238.00	0.05	0.03
1.4166	3.29	0.20	4.4667	268.00	0.04	0.02
1.5000	3.25	0.16	4.9667	298.00	0.03	0.02
1.5833	3.24	0.15	5.4667	328.00	0.03	0.02
1.6667	3.27	0.18	5.9667	358.00	0.02	0.01
1.7500	3.25	0.16	6.4667	388.00	0.02	0.01
1.8333	3.24	0.15	6.9667	418.00	0.01	0.01
1.9167	3.24	0.15	7.4667	448.00	0.01	0.01
2.0000	3.22	0.13				
2.5000	3.20	0.11				
3.0000	3.17	0.08				
3.5000	3.15	0.06				
4.0000	3.14	0.05				
4.5000	3.13	0.04				
5.0000	3.12	0.03				
5.5000	3.12	0.03				
6.0000	3.11	0.02				
6.5000	3.11	0.02				
7.0000	3.10	0.01				
7.5000	3.10	0.01				

SLUG TEST - AOT MENDON - MW38

AQUIFER (SLUG) TESTING WORKSHEET VERSION 2.1

TEST DOCUMENTATION	VALUE
DATE	7/17/89
WELL ID	AOT#-MW38
WELL DIAMETER (IN)	2
BOREHOLE RADIUS (IN)	3
TOTAL DEPTH OF WELL (FEET)	15
STATIC WATER LEVEL BELOW TOP OF WELL	2.43
REFERENCE WATER LEVEL	2.23
TYPE OF AQUIFER	UNCONFINED
HERMIT TEST NO.	4
EST. ELAPSED TIME SLUG REMOVED	0.0833
VOLUME OF SLUG (GAL)	0.32
INSTANTANEOUS HEAD CHANGE (FT)	1.98
DEPTH OF HEAD CHANGE (FT BELOW TOC)	4.21
DEPTH TO BASE OF WELL SCREEN (FT BELOW TOC)	17.87
HEIGHT OF SCREEN THROUGH WHICH WATER ENTERS, L (FEET)	5.00
DEPTH TO BASE OF SCREEN - DEPTH TO WATER, H (FEET)	15.44

* CORRECTED FOR TIME SLUG REMOVED & OSCILATION IN W.L.
** OSCILLATION OF WATER LEVEL ENDED.

RECORDED E.T. (MIN)	RECORDED WL (FT)	CHANGE IN DEPTH (FT)	CRCTD* E.T. (MIN)	CRCTD* E.T. (SEC)	CRCTD* HEAD CHG (FT)	H/Ho
0.0000	2.22	-0.01	0.0000	0.00	1.98	1.00
0.0033	2.23	0.00	0.0667	4.00	2.02	1.02
0.0066	2.23	0.00	0.0833	5.00	1.93	0.99
0.0099	2.23	0.00	0.1000	6.00	1.94	0.98
0.0133	2.23	0.00	0.1167	7.00	1.92	0.97
0.0166	2.24	0.01	0.1333	8.00	1.90	0.96
0.0200	2.23	0.00	0.1500	9.00	1.88	0.95
0.0233	2.24	0.01	0.1667	10.00	1.87	0.95
0.0266	2.23	0.00	0.1833	11.00	1.86	0.94
0.0300	2.24	0.01	0.2000	12.00	1.85	0.94
0.0333	2.24	0.01	0.2167	13.00	1.83	0.93
0.0500	2.24	0.01	0.2333	14.00	1.83	0.93
0.0666	2.26	0.03	0.2500	15.00	1.82	0.92
0.0833	2.23	0.00	0.3334	20.00	1.76	0.89
0.1000	3.86	1.63	0.4167	25.00	1.71	0.86
0.1166	3.01	0.78	0.5000	30.00	1.66	0.84
0.1333	4.25	2.02 **	0.5834	35.00	1.62	0.82
0.1500	4.25	2.02	0.6667	40.00	1.58	0.80
0.1666	4.18	1.95	0.7500	45.00	1.54	0.78
0.1833	4.17	1.94	0.8334	50.00	1.51	0.76
0.2000	4.15	1.92	0.9167	55.00	1.47	0.74
0.2166	4.13	1.90	1.0000	60.00	1.44	0.73
0.2333	4.11	1.88	1.0834	65.00	1.40	0.71
0.2500	4.10	1.87	1.1667	70.00	1.37	0.69
0.2666	4.09	1.86	1.2500	75.00	1.34	0.68

HYDRAULIC CONDUCTIVITY CALCULATION

METHOD: BOUWER AND RICE (1976).

EQUATIONS (for fully penetrating wells):
K = (Rc^2 * ln(Re/Rw))/2AL * ln (Yo/Yt)* 1/t
Where ln(Re/Rw) = 1 / {1.1/ln(H/Rw) + [C/(Le/Rw)]}

PARAMETER DEFINITION:

K = Hydraulic conductivity (length/time).
Rc = Well radius (length).
Re = Effective radius over which the slug is dissipated (length).
Rw = Borehole radius (length).
L = Height of screen through which water enters (length).
Yo = H/Ho * start of test (extrapolated from a semilog graph of H/Ho vs elapsed time (sec.).
Yt = H/Ho at an arbitrarily defined time (t) from the semilog semilog graph previously defined above.
H = depth of base of screen - depth to water (length).
C = Coefficient determined from Fig. 3 in Bouwer & Rice (1976).

PARAMETER	VALUE	UNITS	
Rc =	0.08	feet	
Rw =	0.50	feet	
L =	5.00	feet	
Yo =	1.00	dimless	(defined from semilog graph)
Yt =	0.94	dimless	(defined from semilog graph)
t =	10.00	sec	(defined from semilog graph)
L =	5.00	feet	
H =	15.44	feet	(simplifying assumption)
Le/Rw =	10.00		
C =	1.20	dimless	(defined from Fig. 3 (Bouwer & Rice, 1976)

CALCULATIONS:

ln (Re/Rw) = 2.27

K = 0.84 feet/day

SLUG TEST - WOT MEADOW - MW3

0.0833	4.08	1.85	1.3333	80.00	1.21	0.66
0.1666	4.05	1.83	1.4167	85.00	1.27	0.64
0.2166	4.06	1.83	1.5000	90.00	1.26	0.64
0.3333	4.05	1.82	1.5834	95.00	1.23	0.62
0.4167	3.99	1.76	1.6667	100.00	1.20	0.61
0.5000	3.94	1.71	1.7500	105.00	1.17	0.59
0.5833	3.89	1.66	1.8334	110.00	1.15	0.58
0.6667	3.85	1.62	1.9167	115.00	1.13	0.57
0.7500	3.81	1.58	2.4167	145.00	0.99	0.50
0.8333	3.77	1.54	2.9167	175.00	0.87	0.44
0.9167	3.74	1.51	3.4167	205.00	0.77	0.39
1.0000	3.70	1.47	3.9167	235.00	0.68	0.34
1.0833	3.67	1.44	4.4167	265.00	0.60	0.30
1.1667	3.63	1.40	4.9167	295.00	0.53	0.27
1.2500	3.60	1.37	5.4167	325.00	0.46	0.23
1.3333	3.57	1.34	5.9167	355.00	0.43	0.22
1.4166	3.54	1.31	6.4167	385.00	0.39	0.20
1.5000	3.50	1.27	6.9167	415.00	0.35	0.18
1.5833	3.49	1.26	7.4167	445.00	0.32	0.16
1.6667	3.46	1.23	7.9167	475.00	0.29	0.15
1.7500	3.43	1.20	8.4167	505.00	0.27	0.14
1.8333	3.40	1.17	8.9167	535.00	0.24	0.12
1.9167	3.38	1.15	9.4167	565.00	0.24	0.12
2.0000	3.36	1.13	9.9167	595.00	0.22	0.11
2.5000	3.22	0.99	11.9167	715.00	0.18	0.09
3.0000	3.10	0.87				
3.5000	3.00	0.77				
4.0000	2.91	0.68				
4.5000	2.83	0.60				
5.0000	2.76	0.53				
5.5000	2.69	0.46				
6.0000	2.66	0.43				
6.5000	2.62	0.39				
7.0000	2.58	0.35				
7.5000	2.55	0.32				
8.0000	2.52	0.29				
8.5000	2.50	0.27				
9.0000	2.47	0.24				

SLUG TEST - AOT MENDON - MW-4

AQUIFER SLUG TESTING WORKSHEET VERSION 2.1

TEST DOCUMENTATION	VALUE
DATE	6/08/89
WELL ID	AOTM-MW4S
WELL DIAMETER (IN)	2
BOREHOLE RADIUS (IN)	6
TOTAL DEPTH OF WELL (FEET)	15
STATIC WATER LEVEL BELOW TOP OF WELL	12.1
REFERENCE WATER LEVEL	12.16
TYPE OF AQUIFER	UNCONFINED
HERMIT TEST NO.	3
EST. ELAPSED TIME SLUG REMOVED	0.03
VOLUME OF SLUG (GAL)	0.31
INSTANTANEOUS HEAD CHANGE (FT)	1.92
DEPTH OF HEAD CHANGE (FT BELOW TOC)	14.08
DEPTH TO BASE OF WELL SCREEN (FT BELOW TOC)	17.85
HEIGHT OF SCREEN THROUGH WHICH WATER ENTERS, L (FEET)	5.69
DEPTH TO BASE OF SCREEN - DEPTH TO WATER, H (FEET)	5.69

* CORRECTED FOR TIME SLUG REMOVED & OSCILATION IN W.L.
** OSCILLATION OF WATER LEVEL ENDED.

RECORDED E.T. (MIN)	RECORDED WL (FT)	CHANGE IN DEPTH (FT)		CRCTD E.T. (MIN)	CRCTD* E.T. (SEC)	CRCTD* HEAD CHG (FT)	H/HO
0.0000	12.16	0.00		0.0000	0.00	1.92	1.00
0.0033	12.16	0.00		0.0366	2.20	1.47	0.77
0.0066	12.16	0.00		0.0533	3.20	1.29	0.67
0.0099	12.16	0.00		0.0700	4.20	1.16	0.61
0.0133	12.16	0.00		0.0866	5.20	1.06	0.55
0.0166	12.16	0.00		0.1033	6.20	0.97	0.51
0.0200	12.16	0.00		0.1200	7.20	0.88	0.46
0.0233	12.16	0.00		0.1366	8.20	0.81	0.42
0.0266	12.16	0.00		0.1533	9.20	0.74	0.39
0.0300	12.13	-0.03		0.1700	10.20	0.68	0.35
0.0333	12.36	0.20		0.1866	11.20	0.63	0.33
0.0500	13.56	1.40		0.2033	12.20	0.58	0.30
0.0666	13.63	1.47	**	0.2200	13.20	0.54	0.28
0.0833	13.45	1.29		0.2366	14.20	0.49	0.26
0.1000	13.32	1.16		0.2533	15.20	0.45	0.23
0.1166	13.22	1.36		0.2700	16.20	0.42	0.22
0.1333	13.13	0.97		0.2866	17.20	0.39	0.20
0.1500	13.04	0.88		0.3033	18.20	0.35	0.18
0.1666	12.97	0.81		0.3867	23.20	0.23	0.12
0.1833	12.90	0.74		0.4700	28.20	0.16	0.08
0.2000	12.84	0.68		0.5533	33.20	0.11	0.06
0.2166	12.79	0.63		0.6367	38.20	0.08	0.04

HYDRAULIC CONDUCTIVITY CALCULATION

METHOD: BOUWER AND RICE (1976).

EQUATIONS (for fully penetrating wells):
K = (Rc^2 * ln(Re/Rw))/2%L * ln (Yo/Yt)* 1/t
Where ln(Re/Rw) = 1 / (1.1/ln(H/Rw) + (C/(L/Rw)))

PARAMETER DEFINITION:

K = Hydraulic conductivity (length/time).
Rc = Well radius (length).
Re = Effective radius over which the slug is dissipated (length).
Rw = Borehole radius (length).
L = Length of screen through which water enters (length)

Yo = H/Ho @ start of test (extrapolated from a semilog graph of H/Ho vs elapsed time (sec.).
Yt = H/Ho at an arbitrarily defined time (t) from the semilog semilog graph previously defined above.
H = Depth to base of screen - depth to water(length)
C = Coefficient determined from Fig. 3 in Bouwer & Rice (1976).

PARAMETER	VALUE	UNITS	
Rc =	0.08	feet	
Rw =	0.50	feet	
L =	5.69	feet	
Yo =	0.73	dimless	(defined from semilog graph)
Yt =	0.35	dimless	(defined from semilog graph)
t =	10.00	sec	(defined from semilog graph)
L =	5.69	feet	
H =	5.69	feet	(simplifying assumptions)
L/Rw =	11.38		
C =	1.05	dimless	(defined from Fig. 3 (Bouwer & Rice, 1976)

CALCULATIONS:

ln (Re/Rw) = 1.84

K = 7.12 feet/day

SLUG TEST - AGT MENDON - MW-4

0.2333	12.74	0.58	0.7200	43.20	0.05	0.03
0.2500	12.70	0.54	0.8033	48.20	0.04	0.02
0.2666	12.65	0.49	0.8867	53.20	0.03	0.02
0.2833	12.61	0.45	0.9700	58.20	0.02	0.01
0.3000	12.58	0.42	1.0533	63.20	0.01	0.01
0.3166	12.55	0.39	1.1367	68.20	0.01	0.01
0.3333	12.51	0.35	1.2200	73.20	0.01	0.01
0.4167	12.39	0.23	1.3033	78.20	0.01	0.01
0.5000	12.32	0.16	1.3866	83.20	0.01	0.01
0.5833	12.27	0.11	1.4700	88.20	0.01	0.01
0.6667	12.24	0.08	1.5533	93.20	0.01	0.01
0.7500	12.21	0.05	1.6367	98.20	0.01	0.01
0.8333	12.20	0.04	1.7200	103.20	0.00	0.00
0.9167	12.19	0.03	1.8033	108.20	0.00	0.00
1.0000	12.18	0.02	1.8867	113.20	0.00	0.00
1.0833	12.17	0.01	1.9700	118.20	0.00	0.00
1.1667	12.17	0.01				
1.2500	12.17	0.01				
1.3333	12.17	0.01				
1.4166	12.17	0.01				
1.5000	12.17	0.01				
1.5833	12.17	0.01				
1.6667	12.17	0.01				
1.7500	12.16	0.00				
1.8333	12.16	0.00				
1.9167	12.16	0.00				
2.0000	12.16	0.00				

SLUG TEST - AGT HERMOM - MW-5

AQUIFER (SLUG) TESTING WORKSHEET VERSION 2.1

TEST DOCUMENTATION	VALUE
DATE	6/07/89
WELL ID	AGTH-MW5
WELL DIAMETER (IN)	2
BOREHOLE RADIUS (IN)	6
TOTAL DEPTH OF WELL (FEET)	15
STATIC WATER LEVEL BELOW TOP OF WELL	11.75
REFERENCE WATER LEVEL	11.55
TYPE OF AQUIFER	UNCONFINED
HERMIT TEST NO.	0
EST. ELAPSED TIME SLUG REMOVED	0.04
VOLUME OF SLUG (GAL)	0.31
INSTANTANEOUS HEAD CHANGE (FT)	1.92
DEPTH OF HEAD CHANGE (FT BELOW TOC)	13.47
DEPTH TO BASE OF WELL SCREEN (FT BELOW TOC)	18.50
HEIGHT OF SCREEN THROUGH WHICH WATER ENTERS, L (FEET)	7.03
DEPTH TO BASE OF SCREEN - DEPTH TO WATER, H (FEET)	7.03

* CORRECTED FOR TIME SLUG REMOVED & OSCILLATION IN W.L.
OSCILLATION OF WATER LEVEL ENDED.

RECORDED E.T. (MIN)	RECORDED WL (FT)	CHANGE IN DEPTH (FT)		CRCTD E.T. (MIN)	CRCTD E.T. (SEC)	CRCTD HEAD CHG (FT)	H/H0
0.0000	11.55	0.00		0.0000	0.00	1.92	1.00
0.0033	11.55	0.00		0.0766	4.60	1.62	0.85
0.0066	11.55	0.00		0.0933	5.60	1.46	0.76
0.0099	11.55	0.00		0.1100	6.60	1.34	0.70
0.0133	11.55	0.00		0.1266	7.60	1.23	0.64
0.0166	11.55	0.00		0.1433	8.60	1.13	0.59
0.0200	11.55	0.00		0.1600	9.60	1.04	0.54
0.0233	11.55	0.00		0.1766	10.60	0.96	0.50
0.0266	11.55	0.00		0.1933	11.60	0.88	0.46
0.0300	11.55	0.00		0.2100	12.60	0.82	0.43
0.0333	11.55	0.00		0.2266	13.60	0.76	0.40
0.0500	12.03	0.48		0.2433	14.60	0.70	0.37
0.0666	11.60	0.05		0.2600	15.60	0.65	0.34
0.0833	12.56	1.01		0.2766	16.60	0.61	0.32
0.1000	12.90	1.35		0.2933	17.60	0.57	0.30
0.1166	13.17	1.62	*	0.3767	22.60	0.42	0.22
0.1333	13.01	1.46		0.4600	27.60	0.33	0.17
0.1500	12.89	1.34		0.5433	32.60	0.28	0.15
0.1666	12.78	1.23		0.6267	37.60	0.24	0.13
0.1833	12.68	1.13		0.7100	42.60	0.22	0.11
0.2000	12.59	1.04		0.7933	47.60	0.19	0.10
0.2166	12.51	0.96		0.8767	52.60	0.17	0.09

HYDRAULIC CONDUCTIVITY CALCULATION

METHOD: BOUWER AND RICE (1976).

EQUATIONS (for fully penetrating wells):
K = (Rc^2 * ln(Re/Rw))/2GL * ln (Yo/Yt)* 1/t
Where ln(Re/Rw) = 1 / {1.1/ln(H/Rw) + [C/(L/Rw)]}

PARAMETER DEFINITION:

K = Hydraulic conductivity (length/time).
Rc = Well radius (length).
Re = Effective radius over which the slug is dissipated (length).
Rw = Borehole radius (length).
L = Length of screen through which water enters (length)
Yo = H/Ho @ start of test (extrapolated from a semilog graph of
H/Ho vs elapsed time (sec.).
Yt = H/Ho at an arbitrarily defined time (t) from the semilog
semilog graph previously defined above.
H = Depth to base of screen - depth to water (length)
C = Coefficient determined from Fig. 3 in Bouwer & Rice (1976).

PARAMETER	VALUE	UNITS	
Rc =	0.00	feet	
Rw =	0.50	feet	
L =	7.03	feet	
Yo =	1.00	dimless	(defined from semilog graph)
Yt =	0.52	dimless	(defined from semilog graph)
t =	10.00	sec	(defined from semilog graph)
L =	7.03	feet	
H =	7.03	feet	(simplifying assumption)
L/Rw =	14.06		
C =	1.40	dimless	(defined from Fig. 3 (Bouwer & Rice, 1976)

CALCULATIONS:

ln (Re/Rw) = 1.94

K = 5.41 feet/day

SLUG TEST - AOT MENDON - MW-5

0.2333	12.43	0.88	0.9600	57.60	0.16	0.08
0.2500	12.37	0.82	1.0433	62.60	0.15	0.08
0.2666	12.31	0.76	1.1267	67.60	0.13	0.07
0.2833	12.25	0.70	1.2100	72.60	0.13	0.07
0.3000	12.20	0.65	1.2933	77.60	0.11	0.06
0.3166	12.16	0.61	1.3766	82.60	0.11	0.06
0.3333	12.12	0.57	1.4600	87.60	0.10	0.05
0.4167	11.97	0.42	1.5433	92.60	0.10	0.05
0.5000	11.88	0.33	1.6267	97.60	0.08	0.04
0.5833	11.83	0.28	1.7100	102.60	0.08	0.04
0.6667	11.79	0.24	1.7933	107.60	0.07	0.04
0.7500	11.77	0.22	1.8767	112.60	0.07	0.04
0.8333	11.74	0.19	1.9600	117.60	0.06	0.03
0.9167	11.72	0.17	2.4600	147.60	0.05	0.03
1.0000	11.71	0.16	2.9600	177.60	0.03	0.02
1.0833	11.70	0.15	3.4600	207.60	0.02	0.01
1.1667	11.68	0.13				
1.2500	11.68	0.13				
1.3333	11.66	0.11				
1.4166	11.66	0.11				
1.5000	11.65	0.10				
1.5833	11.65	0.10				
1.6667	11.63	0.08				
1.7500	11.63	0.08				
1.8333	11.62	0.07				
1.9167	11.62	0.07				
2.0000	11.61	0.06				
2.5000	11.60	0.05				
3.0000	11.58	0.03				
3.5000	11.57	0.02				

SLUG TEST - ASH MEADOW - MW-6

AQUIFER (SLUG) TESTING WORKSHEET VERSION 2.1

TEST DOCUMENTATION	VALUE
DATE	6/08/89
WELL ID	ASTH-MW6
WELL DIAMETER (IN)	2
BOREHOLE RADIUS (IN)	6
TOTAL DEPTH OF WELL (FEET)	15
STATIC WATER LEVEL BELOW TOP OF WELL	9.84
REFERENCE WATER LEVEL	9.84
TYPE OF AQUIFER	UNCONFINED
HERMIT TEST NO.	4
EST. ELAPSED TIME SLUG REMOVED	0.02
VOLUME OF SLUG (GAL)	0.31
INSTANTANEOUS HEAD CHANGE (FT)	1.92
DEPTH OF HEAD CHANGE (FT BELOW TOC)	11.76
DEPTH TO BASE OF WELL SCREEN (FT BELOW TOC)	10.37
HEIGHT OF SCREEN THROUGH WHICH WATER ENTERS, L (FEET)	0.53
DEPTH TO BASE OF SCREEN - DEPTH TO WATER, H (FEET)	0.53

& CORRECTED FOR TIME SLUG REMOVED & OSCILLATION IN W.L.
&& OSCILLATION OF WATER LEVEL ENDED.

RECORDED E.T. (MIN)	RECORDED WL (FT)	CHANGE IN DEPTH (FT)	CRCTD E.T. (MIN)	CRCTD E.T. (SEC)	CRCTD HEAD CHG (FT)	H/Ho
0.0000	9.84	0.00	0.0000	0.00	1.92	1.00
0.0033	9.84	0.00	0.0466	2.80	1.73	0.90
0.0066	9.84	0.00	0.0633	3.80	1.31	0.68
0.0099	9.84	0.00	0.0800	4.80	1.12	0.58
0.0133	9.84	0.00	0.0966	5.80	0.96	0.50
0.0166	9.84	0.00	0.1133	6.80	0.84	0.44
0.0200	9.89	0.05	0.1300	7.80	0.72	0.38
0.0233	10.42	0.58	0.1466	8.80	0.63	0.33
0.0266	10.66	0.82	0.1633	9.80	0.54	0.28
0.0300	10.84	1.00	0.1800	10.80	0.48	0.25
0.0333	11.40	1.56	0.1966	11.80	0.42	0.22
0.0500	10.80	1.04	0.2133	12.80	0.37	0.19
0.0666	11.57	1.73 &&	0.2300	13.80	0.32	0.17
0.0833	11.15	1.31	0.2466	14.80	0.28	0.15
0.1000	10.96	1.12	0.2633	15.80	0.25	0.13
0.1166	10.80	0.96	0.2800	16.80	0.22	0.11
0.1333	10.68	0.84	0.2966	17.80	0.19	0.10
0.1500	10.56	0.72	0.3133	18.80	0.17	0.09
0.1666	10.47	0.63	0.3967	23.80	0.09	0.05
0.1833	10.38	0.54	0.4800	28.80	0.06	0.03
0.2000	10.32	0.48	0.5633	33.80	0.04	0.02
0.2166	10.26	0.42	0.6467	38.80	0.03	0.02

HYDRAULIC CONDUCTIVITY CALCULATION

METHOD: BOUWER AND RICE (1976).

EQUATIONS (for fully penetrating wells):
K = (Rc^2 * ln(Re/Rw))/2AL * ln (Yo/Yt)* 1/t
Where ln(Re/Rw) = 1 / (1.1/ln(H/Rw) + [C/(L/Rw)])

PARAMETER DEFINITION:

K = Hydraulic conductivity (length/time).
Rc = Well radius (length).
Re = Effective radius over which the slug is dissipated (length).
Rw = Borehole radius (length).
L = Length of screen through which water enters (length)
Yo = H/Ho @ start of test (extrapolated from a semilog graph of H/Ho vs elapsed time (sec.).
Yt = H/Ho at an arbitrarily defined time (t) from the semilog semilog graph previously defined above.
H = Depth to base of screen - depth to water (length)
C = Coefficient determined from Fig. 3 in Bouwer & Rice (1976).

PARAMETER	VALUE	UNITS	
Rc =	0.08	feet	
Rw =	0.50	feet	
L =	0.53	feet	
Yo =	1.00	dimless	(defined from semilog graph)
Yt =	0.27	dimless	(defined from semilog graph)
t =	10.00	sec	(defined from semilog graph)
L =	0.53	feet	
H =	0.53	feet	(simplifying assumption)
L/Rw =	17.06		
C =	1.60	dimless	(defined from Fig. 3 (Bouwer & Rice, 1976)

CALCULATIONS:

ln (Re/Rw) = 2.08

K = 9.56 feet/day

SLUG TEST - AOT MENDON - MW-6

0.2333	10.21	0.37	0.7300	43.80	0.02	0.01
0.2500	10.16	0.32	0.8133	48.80	0.02	0.01
0.2666	10.12	0.28	0.8967	53.80	0.02	0.01
0.2833	10.09	0.25	0.9800	58.80	0.02	0.01
0.3000	10.06	0.22	1.0633	63.80	0.02	0.01
0.3166	10.03	0.19	1.1467	68.80	0.02	0.01
0.3333	10.01	0.17	1.2300	73.80	0.02	0.01
0.4167	9.93	0.09	1.3133	78.80	0.02	0.01
0.5000	9.90	0.06	1.3966	83.80	0.02	0.01
0.5833	9.88	0.04	1.4800	88.80	0.02	0.01
0.6667	9.87	0.03	1.5633	93.80	0.02	0.01
0.7500	9.86	0.02	1.6467	98.80	0.02	0.01
0.8333	9.86	0.02	1.7300	103.80	0.02	0.01
0.9167	9.86	0.02	1.8133	108.80	0.02	0.01
1.0000	9.86	0.02	1.8967	113.80	0.02	0.01
1.0833	9.86	0.02	1.9800	118.80	0.02	0.01
1.1667	9.86	0.02	2.4800	148.80	0.01	0.01
1.2500	9.86	0.02	2.9800	178.80	0.00	0.00
1.3333	9.86	0.02	3.4800	208.80	0.01	0.01
1.4166	9.86	0.02	3.9800	238.80	0.01	0.01
1.5000	9.86	0.02				
1.5833	9.86	0.02				
1.6667	9.86	0.02				
1.7500	9.86	0.02				
1.8333	9.86	0.02				
1.9167	9.86	0.02				
2.0000	9.86	0.02				
2.5000	9.85	0.01				
3.0000	9.84	0.00				
3.5000	9.85	0.01				
4.0000	9.85	0.01				

SLUG TEST - AOT MENDON - MW-7

AQUIFER (SLUG) TESTING WORKSHEET VERSION 2.1

TEST DOCUMENTATION	VALUE
DATE	7/07/89
WELL ID	AOTM-MW7
WELL DIAMETER (IN)	2
BOREHOLE RADIUS (IN)	6
TOTAL DEPTH OF WELL (FEET)	15
STATIC WATER LEVEL BELOW TOP OF WELL	10.74
REFERENCE WATER LEVEL	10.74
TYPE OF AQUIFER	UNCONFINED
HERMIT TEST NO.	4
EST. ELAPSED TIME SLUG REMOVED	0.09
VOLUME OF SLUG (GAL)	0.31
INSTANTANEOUS HEAD CHANGE (FT)	1.92
DEPTH OF HEAD CHANGE (FT BELOW TOC)	12.66
DEPTH TO BASE OF WELL SCREEN (FEET BELOW TOC)	18.35
HEIGHT OF SCREEN THROUGH WHICH WATER ENTERS, L (FEET)	7.61
DEPTH TO BASE OF SCREEN - DEPTH TO WATER, H (FEET)	7.61

$ CORRECTED FOR TIME SLUG REMOVED & OSCILATION IN W.L.
$$ OSCILLATION OF WATER LEVEL ENDED.

RECORDED E.T. (MIN)	RECORDED WL (FT)	CHANGE IN DEPTH (FT)		CRCTD E.T. (MIN)	CRCTD E.T. (SEC)	CRCTD HEAD CHG (FT)	H/Ho
0.0000	10.74	0.00		0.0000	0.00	1.92	1.00
0.0033	10.74	0.00		0.0100	0.60	1.16	0.61
0.0066	10.74	0.00		0.0400	3.60	1.15	0.60
0.0099	10.74	0.00		0.0766	4.60	0.78	0.41
0.0133	10.74	0.00		0.0933	5.60	0.51	0.27
0.0166	10.75	0.01		0.1100	6.60	0.32	0.17
0.0200	10.75	0.01		0.1266	7.60	0.21	0.11
0.0233	10.75	0.01		0.1433	8.60	0.12	0.06
0.0266	10.74	0.00		0.1600	9.60	0.08	0.04
0.0300	10.75	0.01		0.1766	10.60	0.05	0.03
0.0333	10.75	0.01		0.1933	11.60	0.03	0.02
0.0500	10.75	0.01		0.2100	12.60	0.02	0.01
0.0666	10.75	0.01		0.2266	13.60	0.01	0.01
0.0833	10.75	0.01		0.2433	14.60	0.01	0.01
0.1000	11.90	1.16	$$	0.3267	19.60	0.00	0.00
0.1500	11.89	1.15		0.4100	24.60	0.00	0.00
0.1666	11.52	0.78		0.8267	49.60	0.00	0.00
0.1833	11.25	0.51		0.9100	54.60	0.00	0.00
0.2000	11.06	0.32					
0.2166	10.95	0.21					
0.2333	10.86	0.12					
0.2500	10.82	0.08					

HYDRAULIC CONDUCTIVITY CALCULATION

METHOD: BOUWER AND RICE (1976).

EQUATIONS (for fully penetrating wells):
K = (Rc^2 * ln(Re/Rw))/2lL * ln (Yo/Yt)* 1/t
Where ln(Re/Rw) = 1 / {1.1/ln(H/Rw) + [C/(L/Rw)]}

PARAMETER DEFINITION:

K = Hydraulic conductivity (length/time).
Rc = Well radius (length).
Re = Effective radius over which the slug is dissipated (length).
Rw = Borehole radius (length).
L = Length of screen from which water enters (length)
Yo = H/Ho @ start of test (extrapolated from a semilog graph of H/Ho vs elapsed time (sec.).
Yt = H/Ho at an arbitrarily defined time (t) from the semilog graph previously defined above.
H = Depth to base of screen - depth to water (length)
C = Coefficient determined from Fig. 3 in Bouwer & Rice (1976).

PARAMETER	VALUE	UNITS	
Rc =	0.00	feet	
Rw =	0.50	feet	
Le =	7.61	feet	
Yo =	1.00	dimless	(defined from semilog graph)
Yt =	0.24	dimless	(defined from semilog graph)
t =	5.00	sec	(defined from semilog graph)
Le =	7.61	feet	
H =	7.61	feet	(simplifying assumption)
Le/Rw =	15.22		
C =	1.50	dimless	(defined from Fig. 3 (Bouwer & Rice, 1976)

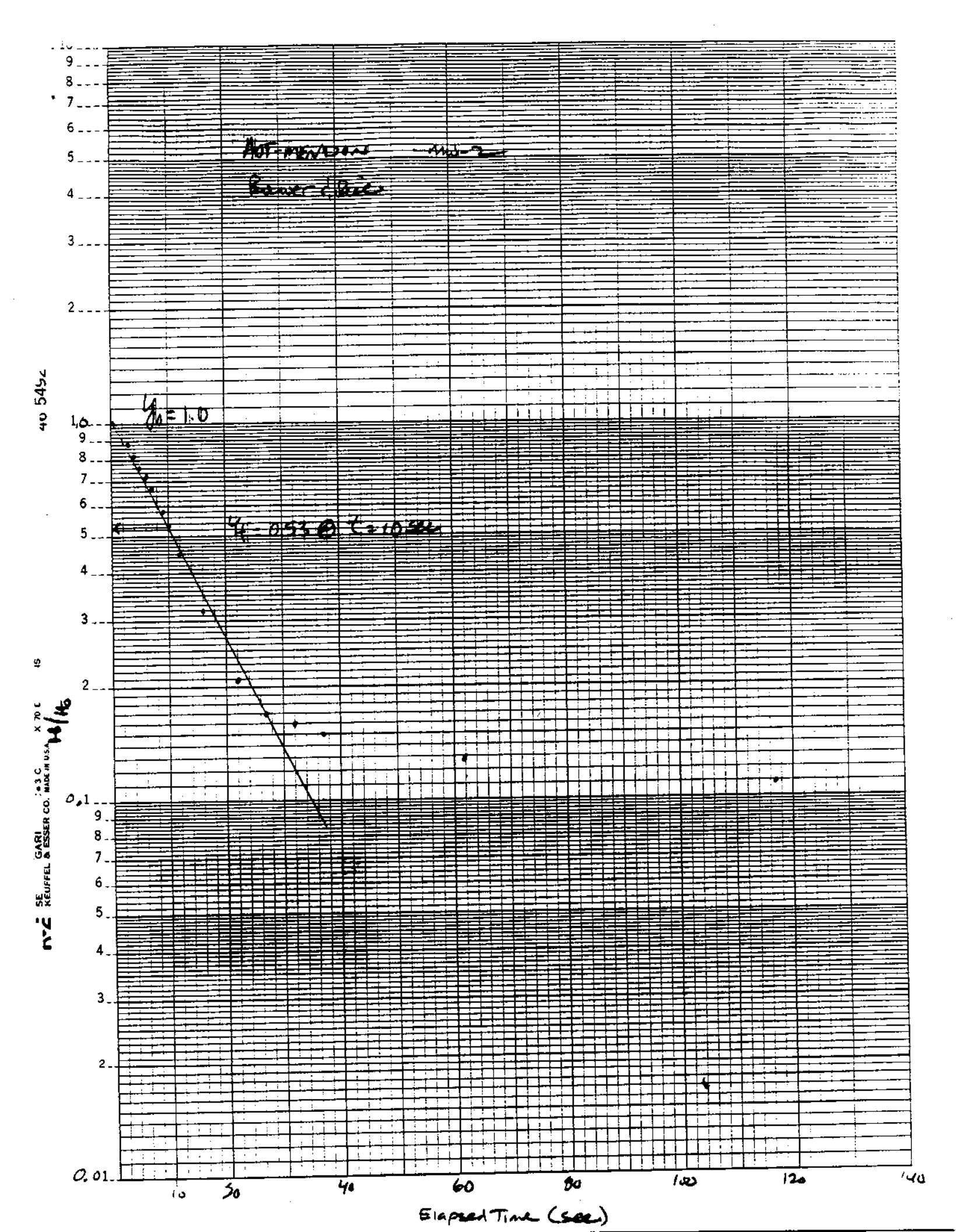
CALCULATIONS:

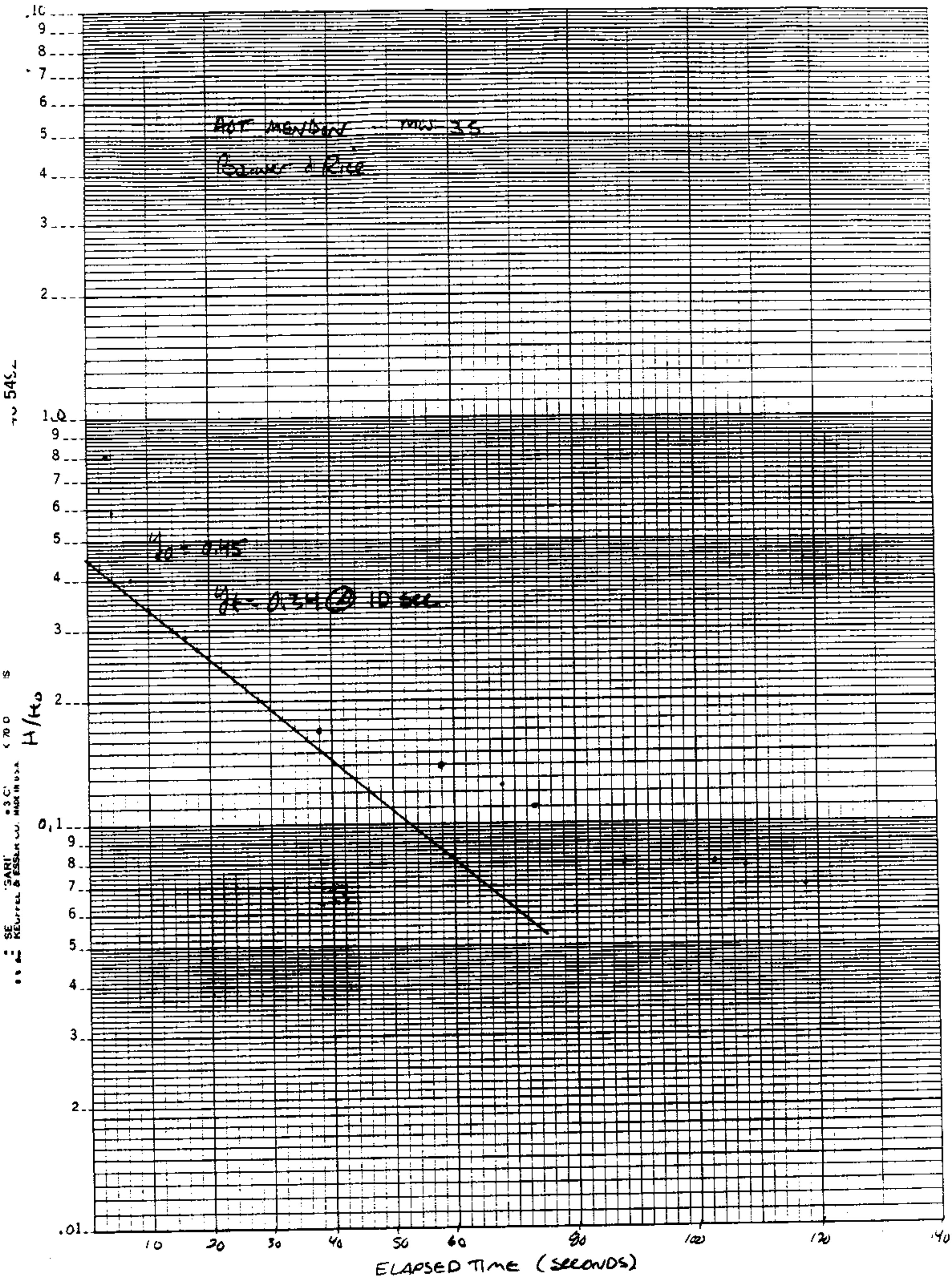
ln (Re/Rw) = 1.99

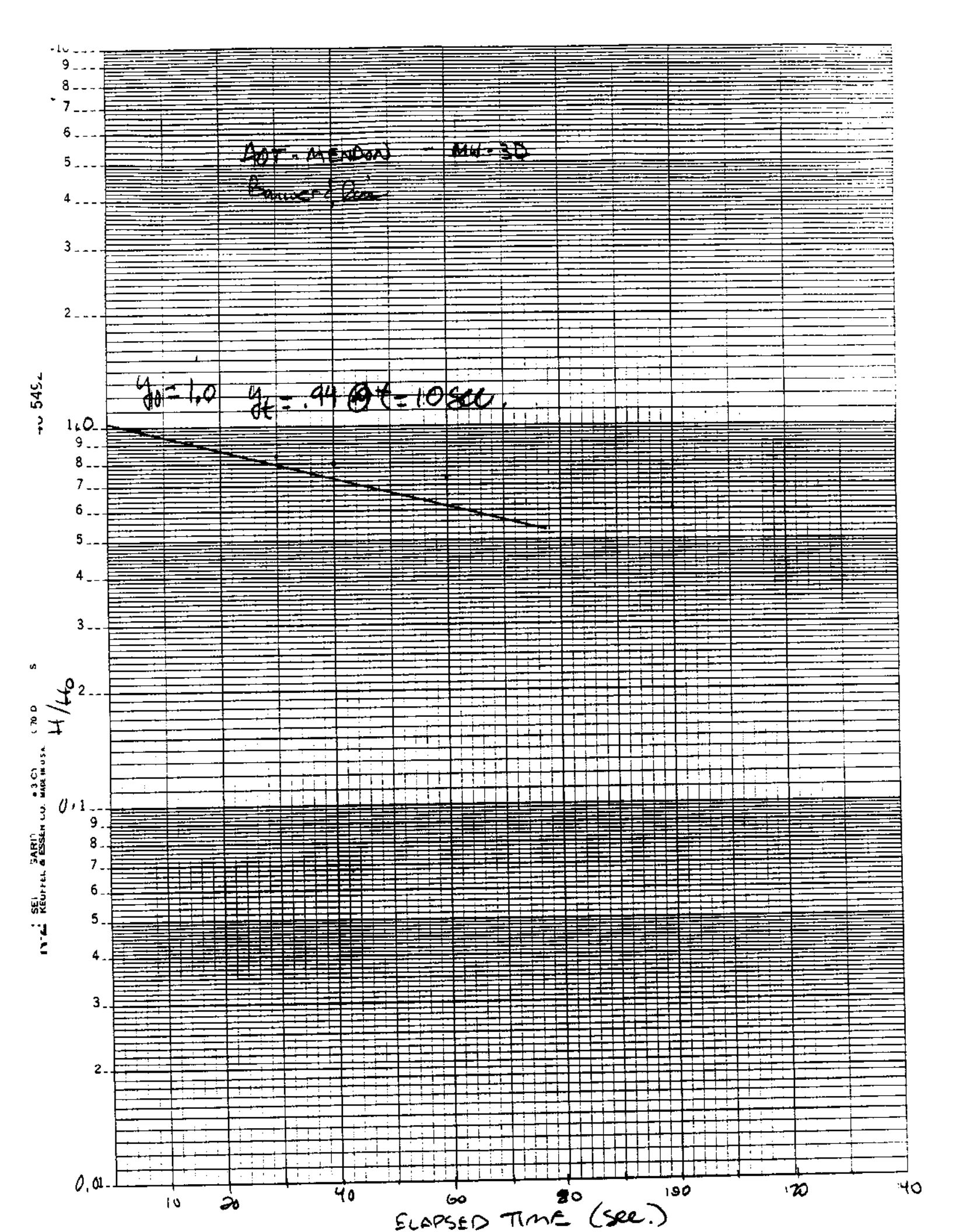
K = 22.39 feet/day

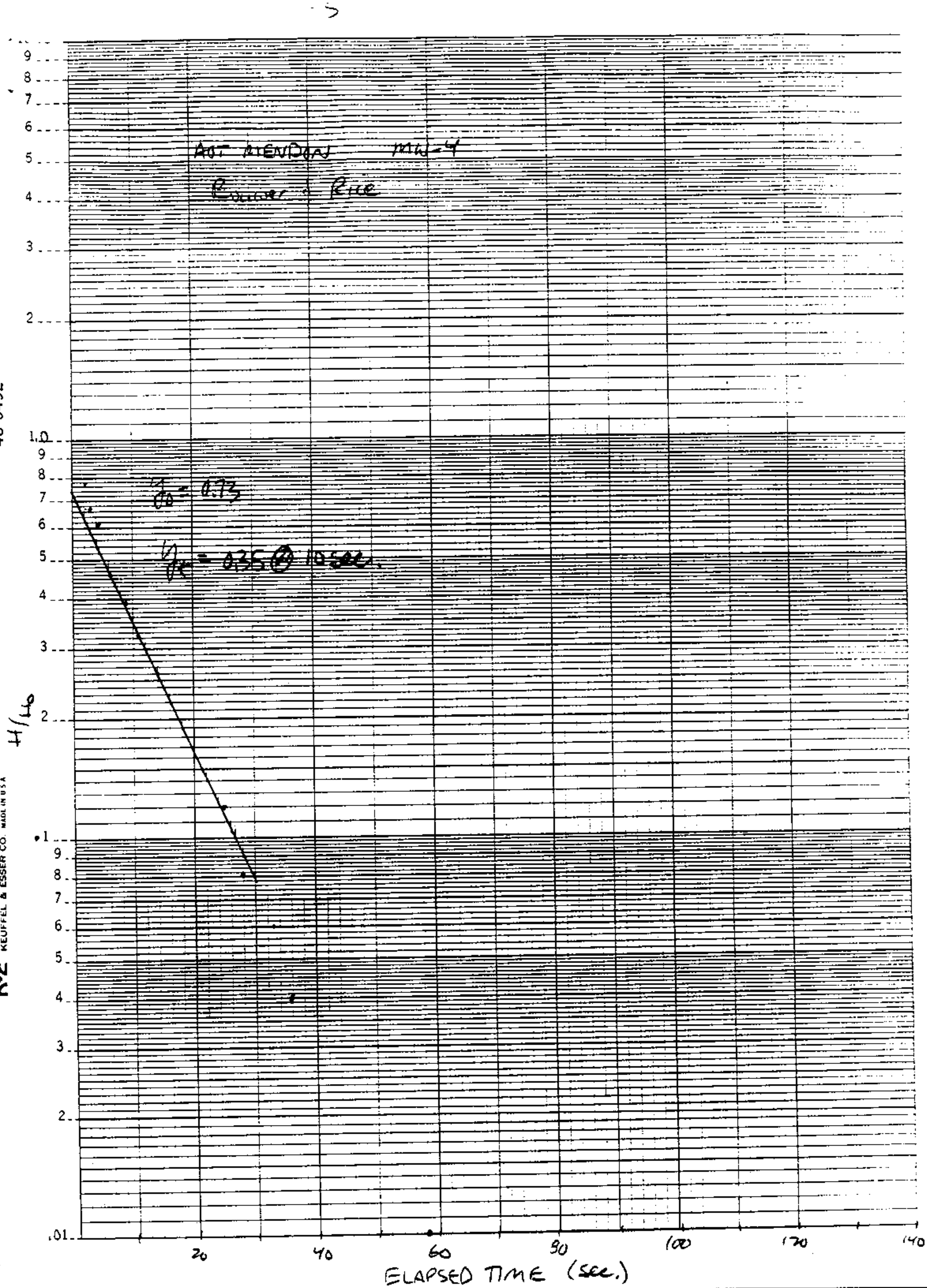
SLUG TEST - HOT MEADOW - MW-7

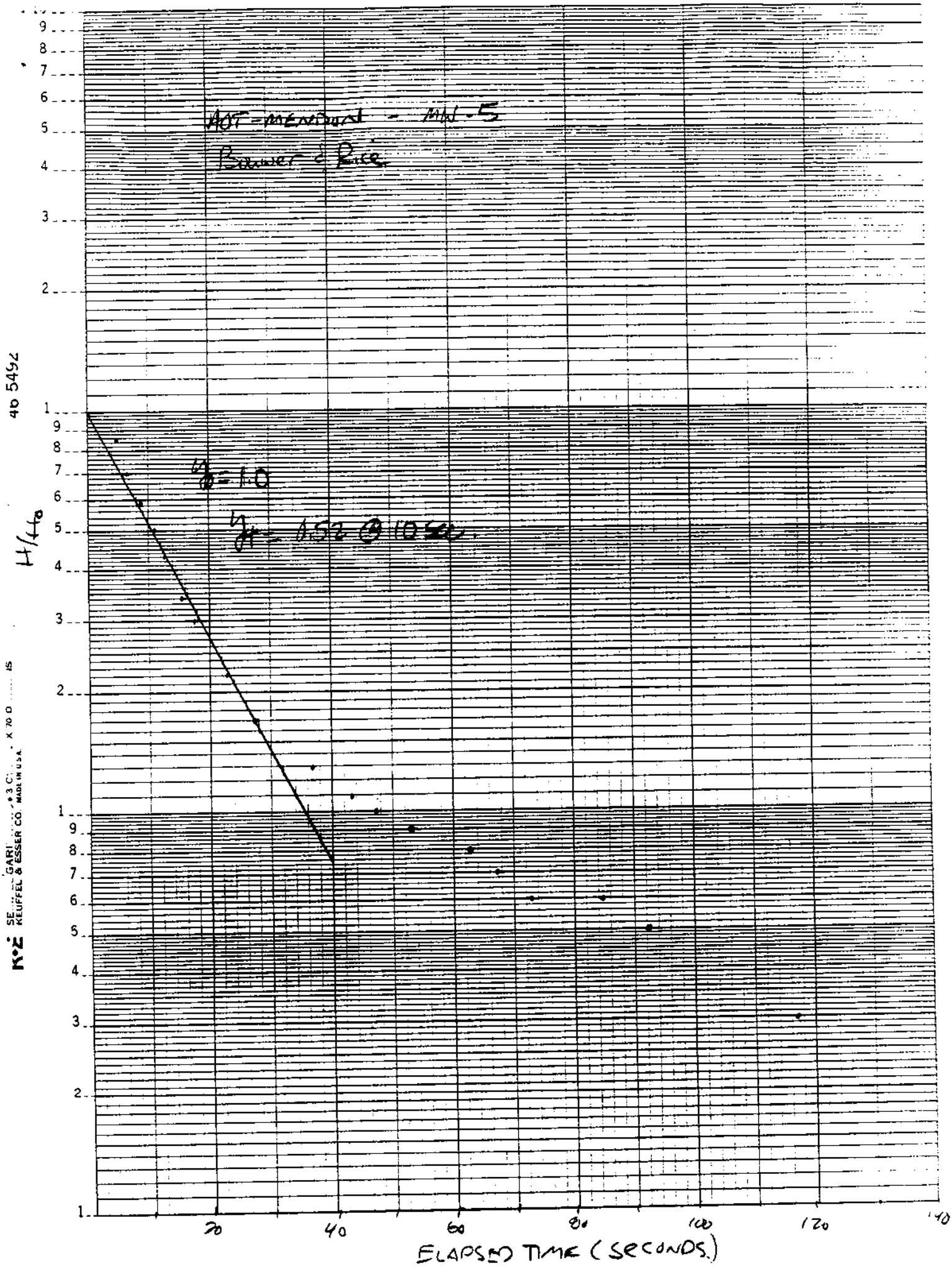
0.2666	10.79	0.05	;
0.2833	10.77	0.03	;
0.3000	10.76	0.02	;
0.3166	10.75	0.01	;
0.3333	10.75	0.01	;
0.4167	10.74	0.00	;
0.5000	10.74	0.00	;
0.9167	10.74	0.00	;
1.0000	10.74	0.00	;

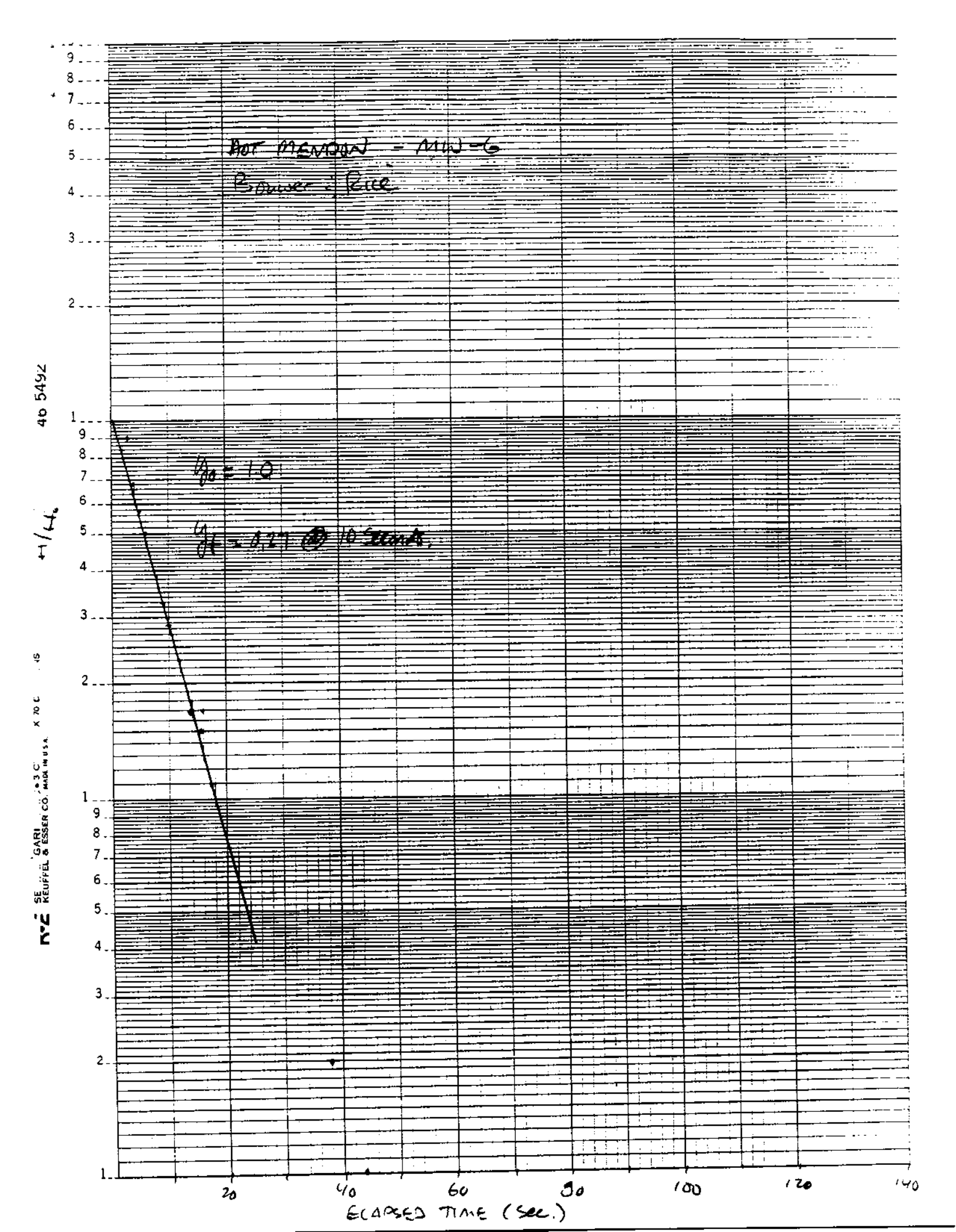

M/M_0
Elapsed Time (sec)
$M/M_0 = 1.0$
$M/M_0 = 0.53$ @ $t = 10$ sec
10
9
8
7
6
5
4
3
2
1.0
0.1
0.01
10
30
40
60
80
100
120
140

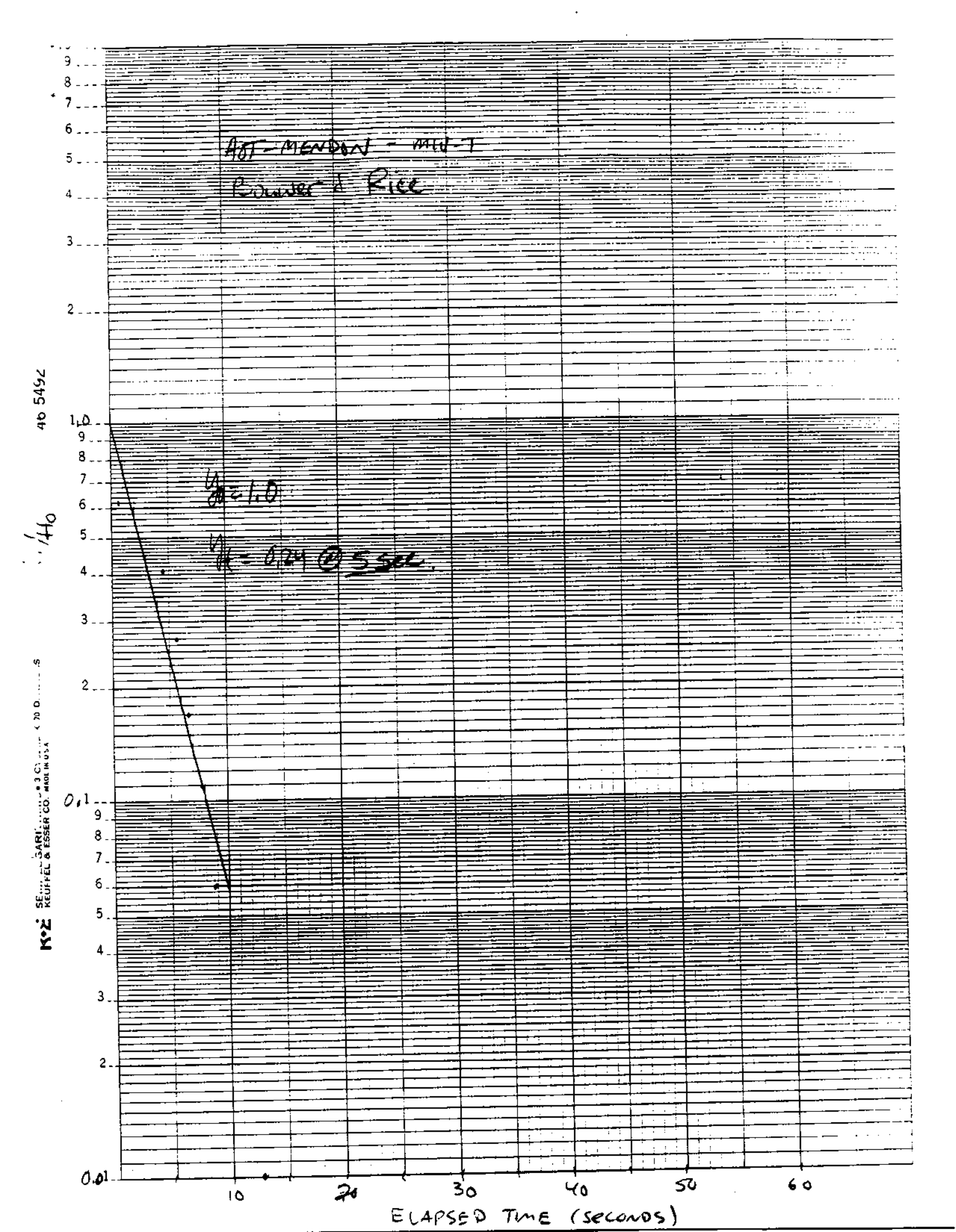

MW-35
Bouwer & Rice
y0 = 0.45
yt = 0.34 @ 10 sec
H/H0
.10
9
8
7
6
5
4
3
2
1.0
0.1
.01
10
20
30
40
50
60
80
100
120
140
ELAPSED TIME (SECONDS)


HOT - MENDON - MW-3D
Barrier Clean
$y_{t0} = 1.0$ $y_t = .94$ @ $t = 10$ sec.
y_t / y_{t0}
ELAPSED TIME (sec.)
1.0
0.1
0.01
10
20
40
60
80
100
120
140


MW-4
Bouwer + Rice
= 0.73
= 0.35 @ 10 sec.
H/Ho
ELAPSED TIME (sec.)


40 5492
K&E SE... GARI ... • 3 C... KEUFFEL & ESSER CO. MADE IN U.S.A. ... X 70 D ... 15
H/H0
9
8
7
6
5
4
3
2
1
20
40
60
80
100
120
140
ELAPSED TIME (SECONDS)
HOT-MEMBRANE - MM-5
Bowser & Rice
H/H0 = 1.0
H/H0 = 0.52 @ 105 sec.


HOT MEMBRANE - MW-6
Bower Reef
$h/h_0 = 1.0$
$h/h_0 = 0.27$ @ 10 min.
h/h₀
ELAPSED TIME (sec.)
20
40
60
80
100
120
140
40 5492
KEUFFEL & ESSER CO. MADE IN U.S.A.


AFT-MENDON - MUD-T
Brauner & Rice
$\psi_m = 1.0$
$\psi_k = 0.24$ @ 5 sec.
ψ/ψ_0
10
20
30
40
50
60
ELAPSED TIME (SECONDS)
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5492

APPENDIX D

ANALYTICAL LABORATORY REPORTS

Industrial & Environmental Analysts, Inc.
P.O. Box 626 • Essex Junction, Vermont 05453 • 802-878-5138

Comments: BQL - BELOW QUANTITATION LIMIT
(a) Please note that Pesticide portion of this report was not requested.

Pest/Herb

JUL 19 19

Std. Methods Method 509A & 509B: SDWA Pesticides/Herbicides

IEA Sample No. 237173 1
Sample Identification Aotm-GW1-006
Date Extracted June 28, 1989
Date Analyzed 6/29/89
By C.Austin

Pesticides

Number	Compound	Quantitation Limit mg/L	Results Concentration mg/L
1	EP-TOX Endrin	0.0001	
2	EP-TOX Lindane	0.0001	(a)
3	EP-TOX Methoxychlor	0.0004	
4	EP-TOX Toxaphene	0.005	

Herbicides

1	EP-TOX 2,4-D	0.002	BQL
2	EP-TOX 2,4,5-TP	0.0004	BQL

Industrial & Environmental Analysts, Inc.
P.O. Box 626 • Essex Junction, Vermont 05453 • 802-878-5138

Comments: BQL - BELOW QUANTITATION LIMIT
(a) Please note that Pesticide portion of this report was not requested.

Pest/Herb

Std. Methods Method 509A & 509B: SDWA Pesticides/Herbicides

IEA Sample No. 237173 2
Sample Identification Aotm-GW2/3-007
Date Extracted June 28, 1989 **Date Analyzed** 6/29/89
By C.Austin

Pesticides

Number	Compound	Quantitation Limit mg/L	Results Concentration mg/L
1	EP-TOX Endrin	0.0001	(a)
2	EP-TOX Lindane	0.0001	
3	EP-TOX Methoxychlor	0.0004	
4	EP-TOX Toxaphene	0.005	

Herbicides

1	EP-TOX 2,4-D	0.002	BQL
2	EP-TOX 2,4,5-TP	0.0004	BQL

Industrial & Environmental Analysts, Inc.
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LAB RESULTS

7/11/89

Wehran Engineering
1 Mill Street, Chace Mill
Burlington, VT 05401-1532

Attention: ~~Andy Blackmore~~ Gary Kjellgren

IEA#: 237173
Date Received: 6/22/89 Date Collected: 6/21/89
Total Samples Received: 11 Total Parameters Requested: 76

Reviewed & Approved by: Bradley J. Reed

Sa#	Sample I.D.	Parameter Studied	Results	Comments
3	Aotm-GW4-001	Chloride	65.9 mg/L	
4	Aotm-GW5-003	Chloride	30.7 mg/L	
5	Aotm-GW6-002	Chloride	97.8 mg/L	
6	Aotm-GW7-004	Chloride	192 mg/L	
7	Aotm-GW-FB-005	Chloride	<0.50 mg/L	
8	Aotm-GW-FB-008	Chloride	<0.50 mg/L	
9	Aotm-GW-UP-001	Chloride	19.6 mg/L	
10	Aotm-GW-DOWN-002	Chloride	20.3 mg/L	
3	Aotm-GW4-001	Chromium, dissolved	<0.025 mg/L	
4	Aotm-GW5-003	Chromium, dissolved	<0.025 mg/L	
5	Aotm-GW6-002	Chromium, dissolved	<0.025 mg/L	
6	Aotm-GW7-004	Chromium, dissolved	<0.025 mg/L	
7	Aotm-GW-FB-005	Chromium, dissolved	<0.025 mg/L	
8	Aotm-GW-FB-008	Chromium, dissolved	<0.025 mg/L	
9	Aotm-GW-UP-001	Chromium, dissolved	<0.025 mg/L	
10	Aotm-GW-DOWN-002	Chromium, dissolved	<0.025 mg/L	
3	Aotm-GW4-001	Conductivity	313 µmhos @25°C	
4	Aotm-GW5-003	Conductivity	447 µmhos @25°C	
5	Aotm-GW6-002	Conductivity	600 µmhos @25°C	
6	Aotm-GW7-004	Conductivity	894 µmhos @25°C	
7	Aotm-GW-FB-005	Conductivity	1.47 µmhos @25°C	
8	Aotm-GW-FB-008	Conductivity	1.38 µmhos @25°C	
9	Aotm-GW-UP-001	Conductivity	154 µmhos @25°C	
10	Aotm-GW-DOWN-002	Conductivity	159 µmhos @25°C	
3	Aotm-GW4-001	GC Methods601/602	-	see attached sheets

JUL 14 1989

Comment:

Industrial & Environmental Analysts, Inc.
P.O. Box 626 • Essex Junction, Vermont 05453 • 802-878-5138

LAB RESULTS

7/11/89

Wehran Engineering
1 Mill Street, Chace Mill
Burlington, VT 05401-1532

Attention: ~~Andy Blackmore~~ Gary Kjellgren

IEA#: 237173
Date Received: 6/22/89
Total Samples Received: 11
Date Collected: 6/21/89
Total Parameters Requested: 76
Reviewed & Approved by: Bradley J. Edwards

Sa#	Sample I.D.	Parameter Studied	Results	Comments
4	Aotm-GW5-003	GC Methods601/602	-	see attached sheets
5	Aotm-GW6-002	GC Methods601/602	-	see attached sheets
6	Aotm-GW7-004	GC Methods601/602	-	see attached sheets
7	Aotm-GW-FB-005	GC Methods601/602	-	see attached sheets
8	Aotm-GW-FB-008	GC Methods601/602	-	see attached sheets
9	Aotm-~~GW~~ SWM-UP-001	GC Methods601/602	-	see attached sheets
10	Aotm-~~GW~~ SWM-DOWN-002	GC Methods601/602	-	see attached sheets
3	Aotm-GW4-001	Iron, dissolved	<0.025 mg/L	
4	Aotm-GW5-003	Iron, dissolved	<0.025 mg/L	
5	Aotm-GW6-002	Iron, dissolved	<0.025 mg/L	
6	Aotm-GW7-004	Iron, dissolved	<0.025 mg/L	
7	Aotm-GW-FB-005	Iron, dissolved	<0.025 mg/L	
8	Aotm-GW-FB-008	Iron, dissolved	<0.025 mg/L	
9	Aotm-~~GW~~ SWM-UP-001	Iron, dissolved	0.136 mg/L	
10	Aotm-~~GW~~ SWM-DOWN-002	Iron, dissolved	0.128 mg/L	
3	Aotm-GW4-001	Lead, total dissolved by graphite	<0.005 mg/L	
4	Aotm-GW5-003	Lead, total dissolved by graphite	<0.005 mg/L	
5	Aotm-GW6-002	Lead, total dissolved by graphite	<0.005 mg/L	
6	Aotm-GW7-004	Lead, total dissolved by graphite	<0.005 mg/L	
7	Aotm-GW-FB-005	Lead, total dissolved by graphite	<0.005 mg/L	
8	Aotm-GW-FB-008	Lead, total dissolved by graphite	<0.005 mg/L	
9	Aotm-~~GW~~ SWM-UP-001	Lead, total dissolved by graphite	<0.005 mg/L	
10	Aotm-~~GW~~ SWM-DOWN-002	Lead, total dissolved by graphite	<0.005 mg/L	
3	Aotm-GW4-001	Manganese, dissolved	<0.010 mg/L	
4	Aotm-GW5-003	Manganese, dissolved	<0.010 mg/L	

Comments:

Industrial & Environmental Analysts, Inc.
P.O. Box 626 • Essex Junction, Vermont 05453 • 802-878-5138

LAB RESULTS

7/11/89

Wehran Engineering
1 Mill Street, Chace Mill
Burlington, VT 05401-1532

Attention: Gary Kjellgren **Andy Blackmore**

IEA#: 237173
Date Received: 6/22/89 Date Collected: 6/21/89
Total Samples Received: 11 Total Parameters Requested: 76
Reviewed & Approved by: Bradley J. Ellert

Sa#	Sample I.D.	Parameter Studied	Results	Comments
5	Aotm-GW6-002	Manganese, dissolved	<0.010 mg/L	
6	Aotm-GW7-004	Manganese, dissolved	1.13 mg/L	
7	Aotm-GW-FB-005	Manganese, dissolved	<0.010 mg/L	
8	Aotm-GW-FB-008	Manganese, dissolved	<0.010 mg/L	
9	Aotm-SGW-UP-001	Manganese, dissolved	0.028 mg/L	
10	Aotm-SGW-DOWN-002	Manganese, dissolved	0.024 mg/L	
3	Aotm-GW4-001	pH	6.11	
4	Aotm-GW5-003	pH	6.35	
5	Aotm-GW6-002	pH	6.35	
6	Aotm-GW7-004	pH	6.39	
7	Aotm-GW-FB-005	pH	5.06	
8	Aotm-GW-FB-008	pH	4.46	
9	Aotm-SGW-UP-001	pH	7.14	
10	Aotm-SGW-DOWN-002	pH	7.21	
1	Aotm-GW1-006	SDWA Herbicide	-	see attached sheets
2	Aotm-GW2/3-007	SDWA Herbicide	-	see attached sheets
3	Aotm-GW4-001	SDWA Herbicide	-	lab accident
3	Aotm-GW4-001	Total organic carbon	2.1 mg/L	
4	Aotm-GW5-003	Total organic carbon	52 mg/L	
5	Aotm-GW6-002	Total organic carbon	38 mg/L	
6	Aotm-GW7-004	Total organic carbon	46 mg/L	
7	Aotm-GW-FB-005	Total organic carbon	0.69 mg/L	
8	Aotm-GW-FB-008	Total organic carbon	0.43 mg/L	
9	Aotm-SGW-UP-001	Total organic carbon	12 mg/L	
10	Aotm-SGW-DOWN-002	Total organic carbon	12 mg/L	

Comment:

Industrial & Environmental Analysts, Inc.
P.O. Box 626 • Essex Junction, Vermont 05453 • 802-878-5138

EPA Method 601:
Purgeable Halocarbons

IEA Sample No.: 237173 3
Sample Identification: Aotm-GW4-001
Date Collected: 6/21/89
Date Analyzed: 6/29/89 By: CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Bromodichloromethane	1.0	BQL
2	Bromoform	1.0	BQL
3	Bromomethane	1.0	BQL
4	Carbon tetrachloride	1.0	BQL
5	Chlorobenzene	1.0	BQL
6	Chloroethane	1.0	BQL
7	2-Chloroethylvinyl ether	1.0	BQL
8	Chloroform	1.0	1.7(B)
9	Chloromethane	1.0	BQL
10	Dibromochloromethane	1.0	BQL
11	1,2-Dichlorobenzene	1.0	BQL
12	1,3-Dichlorobenzene	1.0	BQL
13	1,4-Dichlorobenzene	1.0	BQL
14	Dichlorodifluoromethane	1.0	BQL
15	1,1-Dichloroethane	1.0	BQL
16	1,2-Dichloroethane	1.0	BQL
17	1,1-Dichloroethene	1.0	BQL
18	trans-1,2-Dichloroethene	1.0	BQL
19	1,2-Dichloropropane	1.0	BQL
20	cis-1,3-Dichloropropene	1.0	BQL
21	trans-1,3-Dichloropropene	1.0	BQL
22	Methylene chloride	1.0	BQL
23	1,1,2,2-Tetrachloroethane	1.0	BQL
24	1,1,1-Trichloroethane	1.0	BQL
25	1,1,2-Trichloroethane	1.0	BQL
26	Tetrachloroethene	1.0	BQL
27	Trichlorofluoromethane	1.0	BQL
28	Vinyl Chloride	1.0	BQL
29	Trichloroethene	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT
(B) Compound in blank at approximately 1-2 µg/L

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EPA Method 601:
Purgeable Halocarbons

IEA Sample No.: 237173 4
Sample Identification: Aotm-GW5-003
Date Collected: 6/21/89
Date Analyzed: 6/29/89 By: CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Bromodichloromethane	1.0	BQL
2	Bromoform	1.0	BQL
3	Bromomethane	1.0	BQL
4	Carbon tetrachloride	1.0	BQL
5	Chlorobenzene	1.0	BQL
6	Chloroethane	1.0	BQL
7	2-Chloroethylvinyl ether	1.0	BQL
8	Chloroform	1.0	2.4(B)
9	Chloromethane	1.0	BQL
10	Dibromochloromethane	1.0	BQL
11	1,2-Dichlorobenzene	1.0	BQL
12	1,3-Dichlorobenzene	1.0	BQL
13	1,4-Dichlorobenzene	1.0	BQL
14	Dichlorodifluoromethane	1.0	BQL
15	1,1-Dichloroethane	1.0	BQL
16	1,2-Dichloroethane	1.0	BQL
17	1,1-Dichloroethene	1.0	BQL
18	trans-1,2-Dichloroethene	1.0	BQL
19	1,2-Dichloropropane	1.0	BQL
20	cis-1,3-Dichloropropene	1.0	BQL
21	trans-1,3-Dichloropropene	1.0	BQL
22	Methylene chloride	1.0	BQL
23	1,1,2,2-Tetrachloroethane	1.0	BQL
24	1,1,1-Trichloroethane	1.0	BQL
25	1,1,2-Trichloroethane	1.0	BQL
26	Tetrachloroethene	1.0	BQL
27	Trichlorofluoromethane	1.0	BQL
28	Vinyl Chloride	1.0	BQL
29	Trichloroethene	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT
(B) Compound in blank at approximately 1-2 µg/L

Industrial & Environmental Analysts, Inc.
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EPA Method 601:
Purgeable Halocarbons

IEA Sample No.: 237173 5
Sample Identification: Aotm-GW6-002
Date Collected: 6/21/89
Date Analyzed: 6/29/89 By: CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Bromodichloromethane	1.0	BQL
2	Bromoform	1.0	BQL
3	Bromomethane	1.0	BQL
4	Carbon tetrachloride	1.0	BQL
5	Chlorobenzene	1.0	BQL
6	Chloroethane	1.0	BQL
7	2-Chloroethylvinyl ether	1.0	BQL
8	Chloroform	1.0	3.8(B)
9	Chloromethane	1.0	BQL
10	Dibromochloromethane	1.0	BQL
11	1,2-Dichlorobenzene	1.0	BQL
12	1,3-Dichlorobenzene	1.0	BQL
13	1,4-Dichlorobenzene	1.0	BQL
14	Dichlorodifluoromethane	1.0	BQL
15	1,1-Dichloroethane	1.0	BQL
16	1,2-Dichloroethane	1.0	BQL
17	1,1-Dichloroethene	1.0	BQL
18	trans-1,2-Dichloroethene	1.0	BQL
19	1,2-Dichloropropane	1.0	BQL
20	cis-1,3-Dichloropropene	1.0	BQL
21	trans-1,3-Dichloropropene	1.0	BQL
22	Methylene chloride	1.0	BQL
23	1,1,2,2-Tetrachloroethane	1.0	BQL
24	1,1,1-Trichloroethane	1.0	BQL
25	1,1,2-Trichloroethane	1.0	BQL
26	Tetrachloroethene	1.0	BQL
27	Trichlorofluoromethane	1.0	BQL
28	Vinyl Chloride	1.0	BQL
29	Trichloroethene	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT
(B) Compound in blank at approximately 1-2 µg/L

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EPA Method 601:
Purgeable Halocarbons

IEA Sample No.: 237173 6
Sample Identification: Aotm-GW7-004
Date Collected: 6/21/89
Date Analyzed: 6/29/89 By: CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Bromodichloromethane	1.0	BQL
2	Bromoform	1.0	BQL
3	Bromomethane	1.0	BQL
4	Carbon tetrachloride	1.0	BQL
5	Chlorobenzene	1.0	BQL
6	Chloroethane	1.0	BQL
7	2-Chloroethylvinyl ether	1.0	BQL
8	Chloroform	1.0	1.3(B)
9	Chloromethane	1.0	BQL
10	Dibromochloromethane	1.0	BQL
11	1,2-Dichlorobenzene	1.0	BQL
12	1,3-Dichlorobenzene	1.0	BQL
13	1,4-Dichlorobenzene	1.0	BQL
14	Dichlorodifluoromethane	1.0	BQL
15	1,1-Dichloroethane	1.0	BQL
16	1,2-Dichloroethane	1.0	BQL
17	1,1-Dichloroethene	1.0	BQL
18	trans-1,2-Dichloroethene	1.0	BQL
19	1,2-Dichloropropane	1.0	BQL
20	cis-1,3-Dichloropropene	1.0	BQL
21	trans-1,3-Dichloropropene	1.0	BQL
22	Methylene chloride	1.0	BQL
23	1,1,2,2-Tetrachloroethane	1.0	BQL
24	1,1,1-Trichloroethane	1.0	BQL
25	1,1,2-Trichloroethane	1.0	BQL
26	Tetrachloroethene	1.0	BQL
27	Trichlorofluoromethane	1.0	BQL
28	Vinyl Chloride	1.0	BQL
29	Trichloroethene	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT
(B) Compound in blank at approximately 1-2 µg/L

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EPA Method 601:
Purgeable Halocarbons

IEA Sample No.: 237173 7
Sample Identification: Aotm-GW-FB-005
Date Collected: 6/21/89
Date Analyzed: 6/29/89 By: CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Bromodichloromethane	1.0	BQL
2	Bromoform	1.0	BQL
3	Bromomethane	1.0	BQL
4	Carbon tetrachloride	1.0	BQL
5	Chlorobenzene	1.0	BQL
6	Chloroethane	1.0	BQL
7	2-Chloroethylvinyl ether	1.0	BQL
8	Chloroform	1.0	1.6(B)
9	Chloromethane	1.0	BQL
10	Dibromochloromethane	1.0	BQL
11	1,2-Dichlorobenzene	1.0	BQL
12	1,3-Dichlorobenzene	1.0	BQL
13	1,4-Dichlorobenzene	1.0	BQL
14	Dichlorodifluoromethane	1.0	BQL
15	1,1-Dichloroethane	1.0	BQL
16	1,2-Dichloroethene	1.0	BQL
17	1,1-Dichloroethene	1.0	BQL
18	trans-1,2-Dichloroethene	1.0	BQL
19	1,2-Dichloropropane	1.0	BQL
20	cis-1,3-Dichloropropene	1.0	BQL
21	trans-1,3-Dichloropropene	1.0	BQL
22	Methylene chloride	1.0	BQL
23	1,1,2,2-Tetrachloroethane	1.0	BQL
24	1,1,1-Trichloroethane	1.0	BQL
25	1,1,2-Trichloroethane	1.0	BQL
26	Tetrachloroethene	1.0	BQL
27	Trichlorofluoromethane	1.0	BQL
28	Vinyl Chloride	1.0	BQL
29	Trichloroethene	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT
(B) Compound in blank at approximately 1-2 µg/L

Industrial & Environmental Analysts, Inc.
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EPA Method 601:
Purgeable Halocarbons

IEA Sample No.: 237173 8
Sample Identification: Aotm-GW-FB-008
Date Collected: 6/21/89
Date Analyzed: 6/29/89 By: CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Bromodichloromethane	1.0	BQL
2	Bromoform	1.0	BQL
3	Bromomethane	1.0	BQL
4	Carbon tetrachloride	1.0	BQL
5	Chlorobenzene	1.0	BQL
6	Chloroethane	1.0	BQL
7	2-Chloroethylvinyl ether	1.0	BQL
8	Chloroform	1.0	BQL
9	Chloromethane	1.0	BQL
10	Dibromochloromethane	1.0	BQL
11	1,2-Dichlorobenzene	1.0	BQL
12	1,3-Dichlorobenzene	1.0	BQL
13	1,4-Dichlorobenzene	1.0	BQL
14	Dichlorodifluoromethane	1.0	BQL
15	1,1-Dichloroethane	1.0	BQL
16	1,2-Dichloroethane	1.0	BQL
17	1,1-Dichloroethene	1.0	BQL
18	trans-1,2-Dichloroethene	1.0	BQL
19	1,2-Dichloropropane	1.0	BQL
20	cis-1,3-Dichloropropene	1.0	BQL
21	trans-1,3-Dichloropropene	1.0	BQL
22	Methylene chloride	1.0	BQL
23	1,1,2,2-Tetrachloroethene	1.0	BQL
24	1,1,1-Trichloroethane	1.0	BQL
25	1,1,2-Trichloroethane	1.0	BQL
26	Tetrachloroethene	1.0	BQL
27	Trichlorofluoromethane	1.0	BQL
28	Vinyl Chloride	1.0	BQL
29	Trichloroethene	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT

Industrial & Environmental Analysts, Inc.
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EPA Method 601:
Purgeable Halocarbons

IEA Sample No.: 237173 9
Sample Identification: Aotm-SW-UP-001
Date Collected: 6/21/89
Date Analyzed: 6/29/89 By: CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Bromodichloromethane	1.0	BQL
2	Bromoform	1.0	BQL
3	Bromomethane	1.0	BQL
4	Carbon tetrachloride	1.0	BQL
5	Chlorobenzene	1.0	BQL
6	Chloroethane	1.0	BQL
7	2-Chloroethylvinyl ether	1.0	BQL
8	Chloroform	1.0	1.5(B)
9	Chloromethane	1.0	BQL
10	Dibromochloromethane	1.0	BQL
11	1,2-Dichlorobenzene	1.0	BQL
12	1,3-Dichlorobenzene	1.0	BQL
13	1,4-Dichlorobenzene	1.0	BQL
14	Dichlorodifluoromethane	1.0	BQL
15	1,1-Dichloroethane	1.0	BQL
16	1,2-Dichloroethane	1.0	BQL
17	1,1-Dichloroethene	1.0	BQL
18	trans-1,2-Dichloroethene	1.0	BQL
19	1,2-Dichloropropane	1.0	BQL
20	cis-1,3-Dichloropropene	1.0	BQL
21	trans-1,3-Dichloropropene	1.0	BQL
22	Methylene chloride	1.0	BQL
23	1,1,2,2-Tetrachloroethane	1.0	BQL
24	1,1,1-Trichloroethane	1.0	BQL
25	1,1,2-Trichloroethane	1.0	BQL
26	Tetrachloroethene	1.0	BQL
27	Trichlorofluoromethane	1.0	BQL
28	Vinyl Chloride	1.0	BQL
29	Trichloroethene	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT
(B) Compound in blank at approximately 1-2 µg/L

Industrial & Environmental Analysts, Inc.
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EPA Method 601:
Purgeable Halocarbons

IEA Sample No.: 237173 10
Sample Identification: Aotm-SW-DOWN-002
Date Collected: 6/21/89
Date Analyzed: 6/29/89 By: CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Bromodichloromethane	1.0	BQL
2	Bromoform	1.0	BQL
3	Bromomethane	1.0	BQL
4	Carbon tetrachloride	1.0	BQL
5	Chlorobenzene	1.0	BQL
6	Chloroethane	1.0	BQL
7	2-Chloroethylvinyl ether	1.0	BQL
8	Chloroform	1.0	1.5(B)
9	Chloromethane	1.0	BQL
10	Dibromochloromethane	1.0	BQL
11	1,2-Dichlorobenzene	1.0	BQL
12	1,3-Dichlorobenzene	1.0	BQL
13	1,4-Dichlorobenzene	1.0	BQL
14	Dichlorodifluoromethane	1.0	BQL
15	1,1-Dichloroethane	1.0	BQL
16	1,2-Dichloroethane	1.0	BQL
17	1,1-Dichloroethene	1.0	BQL
18	trans-1,2-Dichloroethene	1.0	BQL
19	1,2-Dichloropropane	1.0	BQL
20	cis-1,3-Dichloropropene	1.0	BQL
21	trans-1,3-Dichloropropene	1.0	BQL
22	Methylene chloride	1.0	BQL
23	1,1,2,2-Tetrachloroethane	1.0	BQL
24	1,1,1-Trichloroethane	1.0	BQL
25	1,1,2-Trichloroethane	1.0	BQL
26	Tetrachloroethene	1.0	BQL
27	Trichlorofluoromethane	1.0	BQL
28	Vinyl Chloride	1.0	BQL
29	Trichloroethene	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT
(B) Compound in blank at approximately 1-2 µg/L

Industrial & Environmental Analysts, Inc.
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EPA Method 601:
Purgeable Halocarbons

IEA Sample No.: 237173 11
Sample Identification: Trip Blank
Date Collected: 6/21/89
Date Analyzed: 6/29/89 By: CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Bromodichloromethane	1.0	BQL
2	Bromoform	1.0	BQL
3	Bromomethane	1.0	BQL
4	Carbon tetrachloride	1.0	BQL
5	Chlorobenzene	1.0	BQL
6	Chloroethane	1.0	BQL
7	2-Chloroethylvinyl ether	1.0	BQL
8	Chloroform	1.0	1.7(B)
9	Chloromethane	1.0	BQL
10	Dibromochloromethane	1.0	BQL
11	1,2-Dichlorobenzene	1.0	BQL
12	1,3-Dichlorobenzene	1.0	BQL
13	1,4-Dichlorobenzene	1.0	BQL
14	Dichlorodifluoromethane	1.0	BQL
15	1,1-Dichloroethane	1.0	BQL
16	1,2-Dichloroethane	1.0	BQL
17	1,1-Dichloroethene	1.0	BQL
18	trans-1,2-Dichloroethene	1.0	BQL
19	1,2-Dichloropropane	1.0	BQL
20	cis-1,3-Dichloropropene	1.0	BQL
21	trans-1,3-Dichloropropene	1.0	BQL
22	Methylene chloride	1.0	BQL
23	1,1,2,2-Tetrachloroethane	1.0	BQL
24	1,1,1-Trichloroethane	1.0	BQL
25	1,1,2-Trichloroethane	1.0	BQL
26	Tetrachloroethene	1.0	BQL
27	Trichlorofluoromethane	1.0	BQL
28	Vinyl Chloride	1.0	BQL
29	Trichloroethene	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT
(B) Compound in blank at approximately 1-2 µg/L

Industrial & Environmental Analysts, Inc.
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EPA Method 602:
Purgeable Aromatics

IEA Sample No. 237173 3
Sample Identification Aotm-GW4-001

Date Collected: 6/21/89
Date Analyzed: 6/29/89 **By:** CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Benzene	1.0	BQL
2	Chlorobenzene	1.0	BQL
3	1,2-Dichlorobenzene	1.0	BQL
4	1,3-Dichlorobenzene	1.0	BQL
5	1,4-Dichlorobenzene	1.0	BQL
6	Ethylbenzene	1.0	BQL
7	Toluene	1.0	BQL
8	Xylenes	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT

Industrial & Environmental Analysts, Inc.
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EPA Method 602:
Purgeable Aromatics

IEA Sample No. 237173 4
Sample Identification Aotm-GW5-003

Date Collected: 6/21/89
Date Analyzed: 6/29/89 **By:** CB

Number	Compound	Quantitation Limit ug/L	Results Concentration ug/L
1	Benzene	1.0	BQL
2	Chlorobenzene	1.0	BQL
3	1,2-Dichlorobenzene	1.0	BQL
4	1,3-Dichlorobenzene	1.0	BQL
5	1,4-Dichlorobenzene	1.0	BQL
6	Ethylbenzene	1.0	BQL
7	Toluene	1.0	BQL
8	Xylenes	1.0	BQL

Comments **BQL - BELOW QUANTITATION LIMIT**

Industrial & Environmental Analysts, Inc.
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EPA Method 602:
Purgeable Aromatics

IEA Sample No. 237173 5
Sample Identification Aotm-GW6-002

Date Collected: 6/21/89
Date Analyzed: 6/29/89 **By:** CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Benzene	1.0	BQL
2	Chlorobenzene	1.0	BQL
3	1,2-Dichlorobenzene	1.0	BQL
4	1,3-Dichlorobenzene	1.0	BQL
5	1,4-Dichlorobenzene	1.0	BQL
6	Ethylbenzene	1.0	BQL
7	Toluene	1.0	BQL
8	Xylenes	1.0	BQL

Comments **BQL - BELOW QUANTITATION LIMIT**

Industrial & Environmental Analysts, Inc.
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EPA Method 602:
Purgeable Aromatics

IEA Sample No. 237173 6
Sample Identification Aotm-GW7-004

Date Collected: 6/21/89
Date Analyzed: 6/29/89 **By:** CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Benzene	1.0	BQL
2	Chlorobenzene	1.0	BQL
3	1,2-Dichlorobenzene	1.0	BQL
4	1,3-Dichlorobenzene	1.0	BQL
5	1,4-Dichlorobenzene	1.0	BQL
6	Ethylbenzene	1.0	BQL
7	Toluene	1.0	BQL
8	Xylenes	1.0	BQL

Comments **BQL - BELOW QUANTITATION LIMIT**

Industrial & Environmental Analysts, Inc.
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EPA Method 602:
Purgeable Aromatics

IEA Sample No. 237173 7
Sample Identification Aotm-GW-FB-005

Date Collected: 6/21/89
Date Analyzed: 6/29/89 **By:** CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Benzene	1.0	BQL
2	Chlorobenzene	1.0	BQL
3	1,2-Dichlorobenzene	1.0	BQL
4	1,3-Dichlorobenzene	1.0	BQL
5	1,4-Dichlorobenzene	1.0	BQL
6	Ethylbenzene	1.0	BQL
7	Toluene	1.0	BQL
8	Xylenes	1.0	2.0

Comments **BQL - BELOW QUANTITATION LIMIT**

Industrial & Environmental Analysts, Inc.
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EPA Method 602:
Purgeable Aromatics

IEA Sample No. 237173 8
Sample Identification Aotm-GW-FB-008

Date Collected: 6/21/89
Date Analyzed: 6/29/89 **By:** CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Benzene	1.0	BQL
2	Chlorobenzene	1.0	BQL
3	1,2-Dichlorobenzene	1.0	BQL
4	1,3-Dichlorobenzene	1.0	BQL
5	1,4-Dichlorobenzene	1.0	BQL
6	Ethylbenzene	1.0	BQL
7	Toluene	1.0	BQL
8	Xylenes	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT

Industrial & Environmental Analysts, Inc.
P.O. Box 626 • Essex Junction, Vermont 05453 • 802-878-5138

EPA Method 602:
Purgeable Aromatics

IEA Sample No. 237173 .9 (collection)
Sample Identification Aotm-GW-UP-001

Date Collected: 6/21/89
Date Analyzed: 6/29/89 **By:** CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Benzene	1.0	BQL
2	Chlorobenzene	1.0	BQL
3	1,2-Dichlorobenzene	1.0	BQL
4	1,3-Dichlorobenzene	1.0	BQL
5	1,4-Dichlorobenzene	1.0	BQL
6	Ethylbenzene	1.0	BQL
7	Toluene	1.0	BQL
8	Xylenes	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT

Industrial & Environmental Analysts, Inc.
P.O. Box 626 • Essex Junction, Vermont 05453 • 802-878-5138

EPA Method 602:
Purgeable Aromatics

IEA Sample No. 237173 10 cc 8/10/89
Sample Identification Aotm-BW-DOWN-002

Date Collected: 6/21/89
Date Analyzed: 6/29/89 **By:** CB

Number	Compound	Quantitation Limit µg/L	Results Concentration µg/L
1	Benzene	1.0	BQL
2	Chlorobenzene	1.0	BQL
3	1,2-Dichlorobenzene	1.0	BQL
4	1,3-Dichlorobenzene	1.0	BQL
5	1,4-Dichlorobenzene	1.0	BQL
6	Ethylbenzene	1.0	BQL
7	Toluene	1.0	BQL
8	Xylenes	1.0	BQL

Comments BQL - BELOW QUANTITATION LIMIT

Industrial & Environmental Analysts, Inc.
P.O. Box 626 • Essex Junction, Vermont 05453 • 802-878-5138

September 27, 1989

Charles D. Race
Wehran Enviro Tech
100 Milk St.
Methuen, Massachusetts 01844

Dear Charles:

As per our telephone conversation of this date, I am hereby notifying you that an error in sample site designation was made in IEA report #237-173. IEA originally identified our sample #' 237-173-9 and -10 as being "AOTM-GW-UP-001" and "AOTM-GW-DOWN-001" respectively. In fact, the site designations for sample #'s 237-173-9 and -10 should have been "AOTM-SW-UP-001" and "AOTM-SW-DOWN-001" respectively. Please make any necessary changes in your records to correct this error.

If we may be of further assistance to you in this matter, please contact us.

Very truly yours,

INDUSTRIAL & ENVIRONMENTAL ANALYSTS, INC.

Brad

Bradley J. Eldred
Vice-President

BJE/skb

Enclosures